SCIENTIFIC AMERICAN

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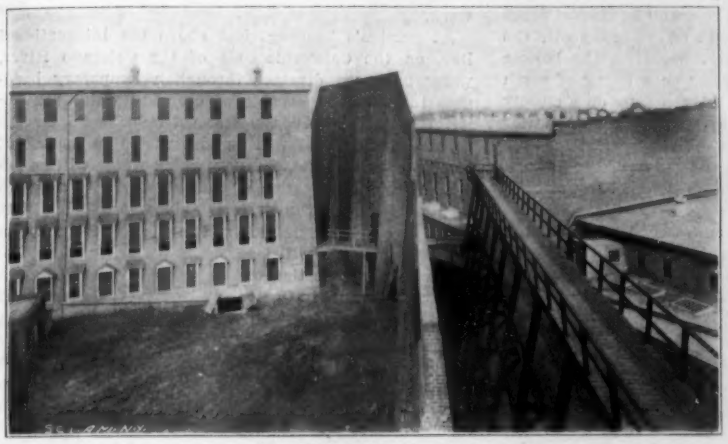

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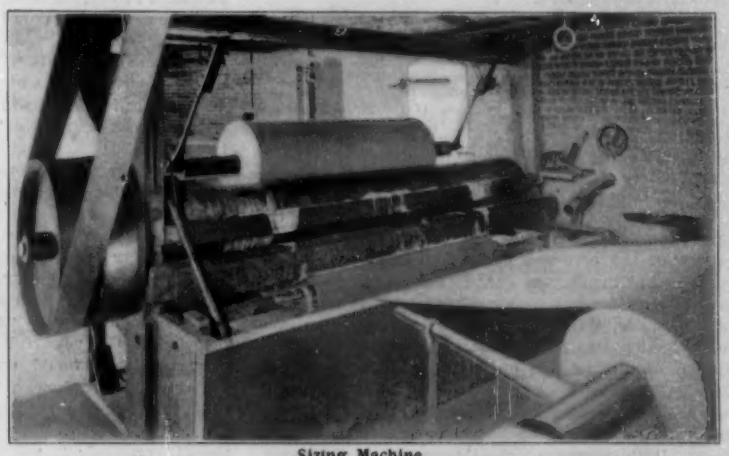

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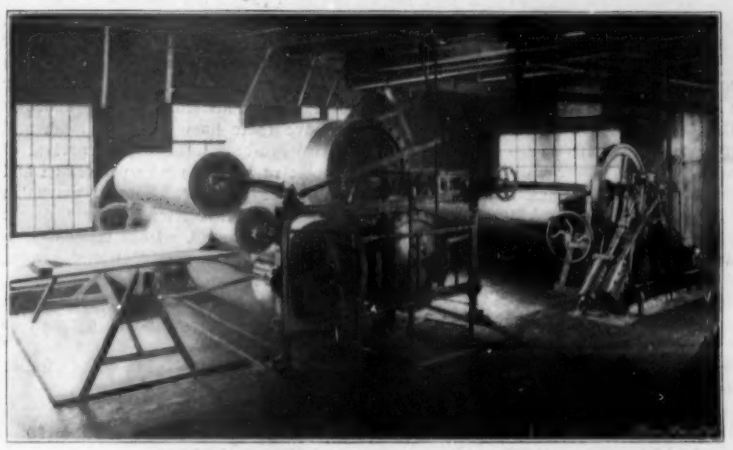

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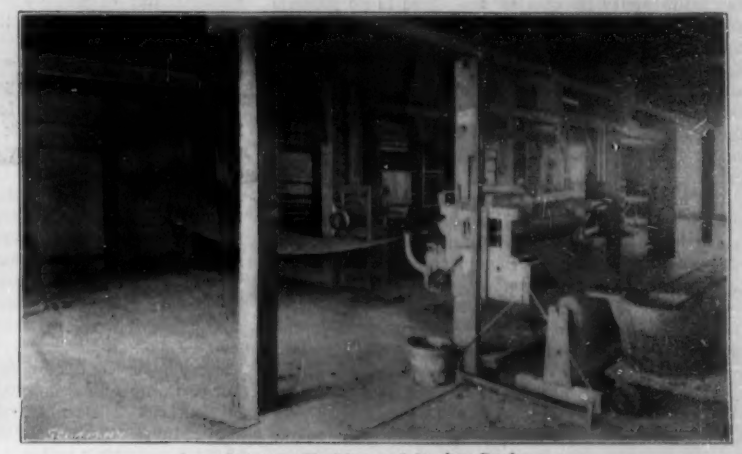

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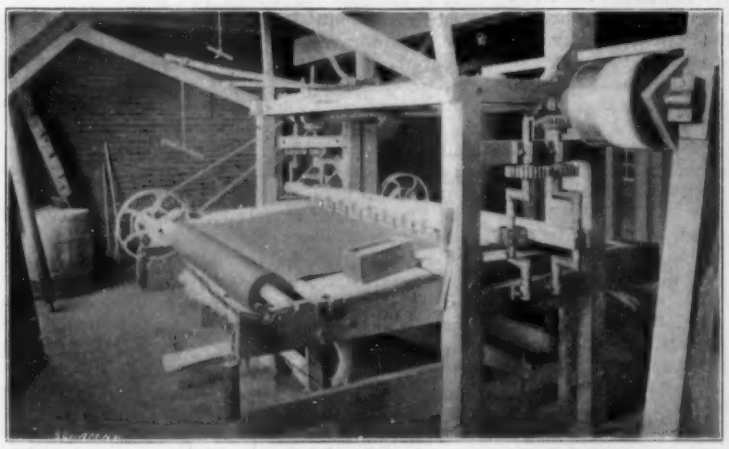

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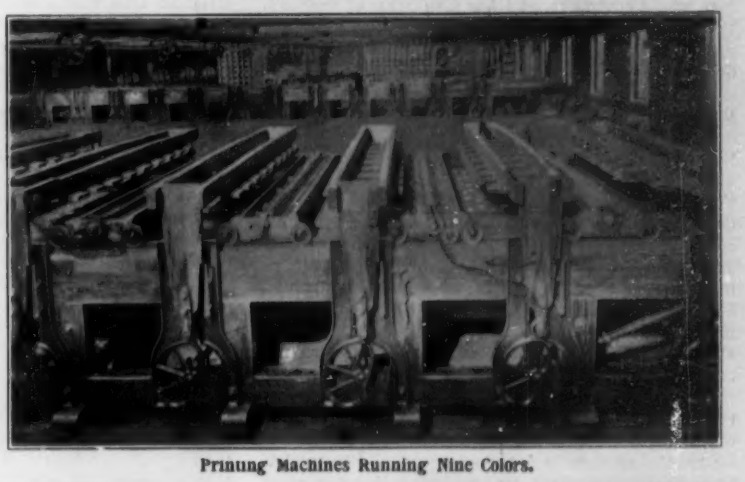

Printing Machines Running Nine Colors.

Hand Printing a Mosaic Pattern.

Varnishing the Printed Oil-Cloth.

THE MANUFACTURE OF OIL-CLOTH.—[See page 302.]

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NEW YORK, SATURDAY, DECEMBER 7, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

RECONSTRUCTION OF THE CROTON DAM.

The board of three engineers appointed by the Aqueduct Commission to examine the design and condition of the core-wall embankments at the Croton Dam and at the Jerome Park Reservoir have reported, and the matter has been referred back to the chief engineer, Mr. William R. Hill, at whose request the investigation was made. It is recommended that the design of that portion of the Croton Dam which is to consist of an earthen embankment with a central core-wall be changed, to prevent the possibility which now exists of leakage and ultimate destruction of the dam. With regard to the Jerome Park Reservoir, the board states its opinion that there is no possible danger of sliding or sloughing of the bank, and that the utmost that can be anticipated is the seepage of a small amount of water through the embankment and the earth; and that this would be carried off by the sewers in the adjacent avenues. It is considered, therefore, that a large expenditure to absolutely prevent such seepage would not be warranted nor advisable.

Dealing first with the Jerome Park Reservoir, it should be explained that this is an artificial basin which is being excavated to form a reservoir of two billion gallons' capacity, the purpose of the scheme being to enlarge the total storage capacity of the local reservoirs within the city's boundary. The reservoir lies in a natural depression on the summit of the ridge of high land which extends between the Harlem Railroad and the line of the Putnam Railway. On a considerable portion of its perimeter the dam is shut in by rising ground, but on other sides it has been necessary to build an artificial embankment to impound the waters. This embankment consists of an earthen dam with a central core-wall or diaphragm of masonry. On certain stretches of this dam the core-wall stands upon a substratum of material which is permeable by water, and Mr. W. R. Hill, the new chief engineer of the Aqueduct Commission, considers that there is danger that when the reservoir is filled, the pressure due to a head of 24 feet would cause a serious leakage through this stratum, which in time might undercut the embankment and lead to serious damage. To test the possibility of such leakage, pits were sunk on the outside of the line of the embankment and coloring material was placed in holes sunk within the area of the basin. Mr. Hill found that the coloring matter passed entirely underneath the embankment, and showed itself after a lapse of time in the test pits. The expert board, however, as we have stated above, are of the opinion that this seepage will not be of sufficient amount to endanger the structure.

At the great Croton Dam, which is being built at the mouth of the Croton watershed for the purpose of impounding some thirty-two billion gallons of water, the problem is a far more serious one, and it is evidently considered by the board that the chief engineer's contention admits of no dispute. The great dam consists of three portions; the first 400 feet on the southern side of the valley is an earth dam with a thin, masonry core-wall; then follows the masonry dam, 650 feet in length, which extends to within 200 feet of the northern side of the valley, where the dam swings around upstream and parallel to the hillside for a distance of 1,000 feet, and finally turns in to a junction with the natural rock of the bluff. This 1,000 feet forms the spillway. In searching for foundations for the masonry dam it was necessary to go down 131 feet below the original depth of the river. The dam at its base measures 216 feet in an up and downstream direction, and the massive masonry rises to a height of 300 feet above the lowest foundation course. The earthen portion of the dam commences abruptly at the end of the masonry dam; a thin interior core-wall 18 feet in thickness at the base and 6 feet at the top extends from the masonry dam proper through to a junction with the side of the hill. This wall is backed on both the upstream and downstream sides by a filling of earth, with a slope in each case of two to one. By virtue of its rock foundation, its enormous width of base, its magnificently-built masonry, and its enormous mass, the masonry portion of this structure is everything that can be desired; but the chief engineer has always had the gravest doubts as to the permanence of the earthen dam, and it is his belief that the security of the whole work can only be assured by continuing the masonry structure clear across the valley and building it to a junction with the original rock of the hillside. That the expert board indorse this view of the situation is shown in the summary of their report to the Aqueduct Commission, the full text of which will be found in current issue of SUPPLEMENT. They state that the new Croton Dam is a reservoir of 125 feet depth of water retained by an artificial embankment, the outer toe of which is 5 feet lower than the bottom of the reservoir and which rests on a filling of earth 100 or more feet deep, which in turn rests on a steeply sloping rock surface. The percolation of water through this embankment to such an extent as may reasonably be expected under the existing conditions would be liable to induce sliding of the bank and its destruction.

We most heartily concur with the findings of the board as far as they concern the Croton Aqueduct. The failure of the masonry portion of the dam, letting loose over thirty billion gallons of water, would not merely produce enormous destruction in the valley below, but the powerful current set up within the reservoir itself would undoubtedly sweep away the old Croton embankment, which will be buried some 30 feet below the surface level of the new Croton Dam. In thus breaking down the embankment of the old reservoir it would deprive New York of its whole source of water supply, for both the old and the new aqueducts take their supply directly from the old Croton Reservoir.

IRRIGATION OF THE DELTA OF THE COLORADO.

No more interesting series of engineering problems has been worked out of late than those connected with the irrigation of the delta of the Colorado River, including lands in Arizona, California and Lower California, Mexico. At the time of writing (November 1, 1901) water is in use for the irrigation of several thousand acres of land, while it is expected that before the close of the coming winter fully 200,000 acres will be subject to irrigation.

The total area which will be brought under irrigation within two or three years on the delta is estimated as follows: In Arizona, from several canals leading from the Colorado River, 150,000 acres; in Lower California, from similar canals, 300,000 acres; in Southern California, from similar canals, 500,000 acres; in Southern California, from artesian wells, 50,000 acres. This makes a total of 1,000,000 acres of irrigable land where heretofore has been desert, and considerably the most forbidding desert on the American continent. That the addition of that vast amount of productive soil, most of which will be devoted to cattle raising, will greatly increase the productive power of the far Southwest is already being demonstrated.

The Colorado River delta includes land which ranges from about 100 feet above sea level to 380 feet below the level of the sea, the latter point being the Salton sink, or salt marsh, in Riverside County, California.

The character of the soil throughout the delta has great uniformity, and it is evident that to a great extent the deposit of silt, aside from shutting off the gulf water, is responsible for the desert character of the land. In the Southern California section, known as the Colorado desert, alone there is an area of about 75 miles square, not all of which is subject to reclamation, in which *no* water is known to exist for the preservation of the lives of the travelers, aside from that which is hauled in by the Southern Pacific Railroad and that which is being brought in for irrigation purposes, while the temperature ranges from a minimum of 20 deg. above zero in the winter to a maximum of about 116 deg. above zero in the summer, there being six or seven calendar months in each year during which the mercury records at least 100 deg.

The extreme dryness of the atmosphere causes so rapid evaporation of moisture from the skin that human temperature does not rise above normal blood heat when there is ample drinking water to feed the pores of the skin. But with an absence of drinking water, the skin becomes dry, fever ensues and delirium and death soon come. The Colorado Desert has thus claimed many victims, but the wide-reaching irrigation canals have put an end to that variety of suffering in this region forever, and one can live on the desert with a much greater degree of comfort than he can in many regions where the mercury marks a lower maximum temperature, but where the degree of humidity is greater.

It was some forty-five years ago that army engineers first called the attention of the government to the possibility of redeeming the Colorado delta by using the water of the river for irrigation. But long the project lay dormant, and while it was an ideal line of irrigation development for the government to undertake for the rescuing of its own lands, the venture awaited the initiative of several private individuals and corporations, one of which is constructing canals for the 500,000 acres in Southern California and the 300,000 acres in Lower California, under the direction of George Chaffey, C.E., and member of the Institute of Mechanical Engineers of London.

The task of making an adequate survey of the 500,000 acres in Southern California has proceeded continuously through all degrees of temperature, and as closely as possible earlier surveys have been followed, though they serve more to confuse than to assist the work.

At Hanlon's heading, just above the international line, on the California side of the Colorado River, water has been diverted through a temporary headgate into a canal capable of carrying water for the irrigation of over 100,000 acres of land, and later the permanent headgate will be constructed in a bluff of cement conglomerate, through which water will be admitted for the irrigation of the entire 800,000 acres to be placed under the system, this water being first taken into a large natural settling basin, from which a series of canals will lead.

A very large portion of the water is provided with a natural channel in Carter and New rivers, which lead for more than sixty miles on good grade through Lower California, delivering the water again at the international line, for use in irrigating the California lands. Thence the water is taken in a series of large canals, distributed through a series of laterals, and thence into the ditches of the individual farmers, the system being based on an allowance of four acre feet a year for all the land under the system.

The settlement of the delta is progressing rapidly, the population of the Colorado Desert alone making net gains of from five to ten persons a day, while the rate of increase is rising steadily. One year ago the desert was unpopulated. To-day about a thousand people have their homes on the land, and hundreds of families are only awaiting the arrival of water at their respective farms to take possession and begin the cultivation of the soil. Some remarkable records have been made in cultivating this desert land. Moving on barren ground, within sixty days a number of farmers have had crops of millet grown, harvested and stacked, with growths of corn and sorghum from four to six feet high. Thus the complexion of the desert is steadily changing, and as a result of irrigation under the several systems, within a year probably 200,000 acres of the delta lands will be under thorough cultivation.

THE CONVERSION OF GRAPE TENDRILS INTO FRUIT CLUSTERS.

It is not generally known that grape tendrils and clusters are identical in origin and anatomical structure, and are frequently changed from one to the other in nature. In the wild state grapes develop tendrils as a means of lifting themselves up into the light and air, and are essential to their well-being; but in the vineyards of to-day, where the vines are carefully trellised by human help, these tendrils are not necessary and are considered a useless draft on the energies of the plant.

In France there is a belief among many growers that the development of large tendrils near what would normally be a fruit cluster tends to make the latter "run to tendrils." It is a common practice of growers passing through the vineyard to remove these tendrils, particularly the larger ones. For the purpose of following the evolution of tendrils into grape clusters Mr. E. Durand, of France, made a series of experiments with several varieties of grapes. The experiments took the form of different methods of treating the tendrils. In one lot that portion of the grape tendril which bears a little leaf at its base was entirely removed. In the second lot this same ramification was removed and in addition the extreme tip of the remaining branch of the tendril was pinched, removing 1 to 2 millimeters or more of the tip. In the third lot the tendrils were allowed to grow freely. The different operations were performed early enough in the season to note the effect of these methods of treating the tendrils on their production of flower buds and fruits.

In the case of the Chasselas variety, out of 292 tendrils not operated upon in any way, 11 tendrils bore flowers, producing in all 230 flower buds, thus showing that tendrils are naturally capable of diversion into flower clusters. Of 298 tendrils which had that ramification entirely removed which bears a small leaf at its base, 58 tendrils bore flowers, having a total of 500 flower buds. Where this same ramification was removed and the tip of the remaining branch of the tendril pinched, 294 tendrils produced 25 fruit clusters, having 223 flower buds. These figures show a difference between the tendrils which had one branch removed and those which were allowed to grow freely, of 270 flower buds, apparently due to the effect of

pinching. Owing to the fact of insects, diseases, etc., not more than half these extra buds set will produce fruit. This reduced to figures means 25 to 30 grammes of fruit per vine, an amount considered too small to pay for the trouble of pinching.

In some varieties under observation a large number of flower clusters were borne naturally on the tendrils. Thus, for example, with the variety Yapindjack from the Orient 15 bunches of grapes and 26 fertile tendrils were borne on 8 shoots naturally, against only 16 tendrils which were not fertile. It is thought that with this variety pinching the tendril, as above noted, would produce a very large increase in fruitfulness.

CAVE DRAWINGS OF THE PALÆOLITHIC EPOCH.

BY OUR PARIS CORRESPONDENT.

In a paper lately read before the Academie des Sciences, Messrs. Capitan and Breuil give a description of two caves or grottoes which they have discovered, whose walls are covered with a remarkable series of drawings of animals which date from the palæolithic epoch. The first of these grottoes, at Combarelles (France), is a long tunnel 690 feet long and varying from 4½ to 6 feet wide. Its height is sometimes 9 feet and again as low as 1½ feet. At the beginning the walls are covered with a stalagmite formation under which some rare lines are seen, but at 360 feet the clearly defined figures begin and continue to the back of the cave over a length of 300 feet, making 600 feet of wall which is more or less covered by the drawings. Most of the figures are covered with a stalagmite coating which sometimes completely hides them; many of them are 3 feet long and 2 to 3 feet high, while others are much smaller. They represent animals for the most part, and many of them are striking in their execution. All the figures are of a correct design and present details which are easily recognizable. Certain figures such as the horse are quite remarkable and show the same character as the best figures engraved on bone of the same epoch. The animals, drawn in whole or in part, include especially the horse and equidæ, the bull, aurochs, wild goat Saiga antelope, reindeer and mammoth. All the figures are of such correct execution that there is no doubt as to their interpretation, such, for instance, as a horse of remarkable design which seems to carry on its back a kind of covering ornamented with triangles; an equide with straight mane having the upper part of the neck very convex and the tail planted very low, also a reindeer whose reproduction is strikingly faithful. The same is true for an aurochs and the head of a wild goat with long horns curved back toward the rear. As to the mammoth, a number of drawings show its well-known features, a very high forehead, curved tusks, hair completely covering the animal and indicated by a number of lines; the trunk is sometimes straight and sometimes curved backward. Some of the figures are entirely covered with the stalagmite formation. It is out of the question that the figures were executed at a period when the reindeer and mammoth were extant in France, which places them in the palæolithic epoch.

The second grotto was discovered at Font-de-Gaume, about a mile from the first. It opens midway up a chalk cliff at 60 feet above the soil of the valley. It has the form of a tunnel 380 feet long with three irregular branches of 45, 63 and 144 feet. Its width varies from 6 to 9 feet and its height sometimes exceeds 21 to 24 feet. In some places the walls come close together, forming narrow passages. The first figures of animals begin at 200 feet from the entrance, after a very narrow passage which opens at 5 feet from the ground in the middle of a stalagmite wall. The general character of the drawings is quite different from those of Combarelles and they have not the same energy and vigor of drawing. They are nearly all formed of a finely engraved line, accentuated by a band of black color from two to four-fifths of an inch wide and circumscribing the whole of the animal. Sometimes certain parts, such as the paws, are entirely painted with this black color; and some of the animals, such as a great reindeer 4½ feet long and a small equide 18 inches long, are entirely painted in black, forming veritable silhouettes like many of the Greek vase paintings. Sometimes the line is traced with red ocher, and in some cases it is very wide. But in most cases the animals, whose outline is indicated by a black line, have their whole surface covered with red ocher. Some parts, such as the head of an aurochs, seem to be painted with black and red, giving a brown color. On others the head is black and the remainder brown. These first examples of fresco painting have been applied sometimes over a series of lines engraved upon the animal and in other cases the lines have been scratched upon the painted surface. Again, the outline is sometimes brought out by an external scratched background, recalling some of the modern engraving processes. A number of the figures are covered with a stalagmite coating which is sometimes nearly an inch thick. Some of the figures are nearly on a level with the ground and others are as high up as 12 feet. Certain of them, for instance, a great aurochs entirely painted in red, measure 8 feet long, and they vary from this down to 18 inches. They represent for the most part the aurochs, of which there are 49 examples, reindeer, equidæ, deer, antelope, mammoth and a few geometric ornaments. It is probable that these figures are of a somewhat later date than those of Combarelles.

NEBULA IN NOVA PERSEI.

BY MARY PROCTOR.

The photographs of the faint nebula surrounding the new star in Perseus, referred to by Prof. Henry Norris Russell in the SCIENTIFIC AMERICAN for November 30, have just been received by the writer from Prof. G. W. Ritchey of the Yerkes Observatory. They are made from his original negatives of September 20 and November 13 respectively.

It will be remembered that attention was called in

NEBULOSITY ABOUT NOVA PERSEI, SEPT. 20, 1901.
Photographed by Prof. G. W. Ritchey, with the Two-foot Reflecting Telescope of the Yerkes Observatory. Exposure, 3 hours and 50 minutes.

Prof. Russell's article to the fact that photographs of Nova Persei revealed the presence of a very faint nebula surrounding the star. Later photographs show that enormous changes have taken place in the nebula, confirming a theory long ago advanced by Sir William Herschel, according to which changes take place in the nebulæ in the course of time.

This theory has not been generally accepted, but now it may be said to be proved by these photographs, showing actual changes which have taken place in the nebula surrounding Nova Persei during the brief period of seven weeks. This would seem to indicate that the gaseous matter forming nebulæ is ever undergoing a process of change and formation, and that from this material—the star-dust scattered throughout the depths of space—new worlds and star-systems are being evolved.

The negative for September 20 was made with an ex-

NEBULOSITY ABOUT NOVA PERSEI, NOV. 13, 1901.
Photographed by Prof. G. W. Ritchey with the Two-foot Telescope of the Yerkes Observatory. Exposure, 7 hours.

posure of 3 hours 50 minutes, and for November 13 with an exposure of 7 hours. The enlargement from the original negatives is about five diameters in each case. The negative of November 13 shows the outer parts of the nebula to have grown much fainter (though the exposure was 3 hours 10 minutes longer), while the strong wisp near the central star (Nova Persei) is much stronger.

The measurement of the negative indicates that the nebula has expanded about *one minute of arc* in all directions in seven weeks, also that it has rotated about the Nova (in the direction of the motion of the hands of a watch) through an angle of about 3 or 4 degrees in that time. The change in density of the wisp near the star is so great that it is difficult to state positively whether there has been a change of shape or position in it.

The rate of motion is of course enormous—far beyond anything known in the stellar universe before. Indeed, if we assume a parallax of 0.01 seconds for the star, the motion of the strong condensation of nebulosity approximates *that of light*. Prof. Chase of Yale has shown that the parallax is extremely small—probably too small for measurement.

The idea is suggested that the enormous changes are not due to *motion of matter* at all, but to change of illumination, electrical or other. But, according to Prof. Ritchey, the change is like that of an expanding ring. Many of the condensations, in fact all of them, are easily recognized in the two photographs, despite this change of position.

These photographs were made with the two-foot reflecting telescope of the Yerkes Observatory, which was made entirely in the optical and instrument laboratories of the Observatory. The mirror of the instrument was made by Prof. G. W. Ritchey, and the greater part of the mounting, including the clockwork, was constructed from his designs and under his supervision. He considers that this instrument is better suited for the work of photographing very faint nebulæ than any other in America, as the focal length of the instrument is very short (aperture being 23½ inches, focal length 93 inches), so that the light-concentration is very great.

SCIENCE NOTES.

A chief merit in acetylene lies in its true rendering of color shades at night, says the Acetylene Gas Journal. One of the recent large installations designed to take advantage of this characteristic is that reported from Muhlbach, in Alsace, in a cotton mill employing 500 hands. Between 800 and 900 jets of acetylene are now in operation daily. But the design is ultimately to employ 1,300 flames. Naturally enough, it is reported that all operatives are highly pleased with this and other qualities of acetylene.

The State Arid Land Grant Commission, which was created by the Legislature with power to reclaim lands given to the State by the general government, under the Carey act, has just celebrated the opening of the great canal system in District No. 4, which comprises 33,000 acres of rich land in the Dearborn Valley, Montana. The State purposes to sell this land in tracts of 160 acres to actual settlers at the cost of placing water upon the land, allowing payment to be made in ten annual installments with 6 per cent interest. Eleven thousand acres are now ready for settlement.

Consul Ravndal reports from Beirut that olive oil has many uses, but more substitutes, and few salads are compounded without the aid of one of them. Cotton-seed oil is a favorite substitute, but, according to an Egyptian newspaper, this is soon to find a sturdy rival in the form of the seed of the sunflower. Experiments made by German chemists have convinced them, it seems, of the availability of this cheap raw material, and it may shortly become a valuable article of commerce. It is said to be convertible to many uses, and, besides having possibilities as a lamp oil, may be used for dyeing purposes, and will be of service in soap making.

The directors of the Pan-American Exposition Company and a number of creditors conferred November 14 and listened to the reading of the financial report of the Company. The report shows the total liabilities of the Company at present to be $3,326,114.69 net, assuming that the assets of $146,454.15 are collectable at face. The Company owes for operating expenses and on construction work $577,945.73, which item is, of course, embodied in the figures of total liabilities. An interesting fact shown by the report is the total cost to the exposition company of the exposition. The cost, according to the report, was $8,860,757.20. The total receipts from admissions after May 1 were $2,467,066.58, and the receipts from concessions were $3,011,522.79. The balance due to first mortgage bondholders is $174,979 and to second mortgage bondholders $500,000, both of which are included in the liabilities as given.

California olive growers are preparing to harvest their crop. In every orchard in the State the trees are loaded with the fruit, and the acreage devoted to the cultivation of olives is much larger this year than ever before. In recent years the yearly crop of olives seldom ran over 2,000 barrels, or, taking seven barrels to the ton, about 286 tons. The growers who sell their olives as they come from the trees have formerly received $60 per ton for their product, or about 3 cents a pound. It costs 1 cent a pound to pick the fruit, thus allowing the growers $40 a ton for their olives. This year the total crop of the State will reach 800 tons, or 5,600 barrels, an increase of 3,600 barrels over last year. The price this year has dropped 33 1-3 per cent. Olives now bring only $40 a ton as they come from the tree, half of which goes to the pickers, thus allowing the growers only $20 a ton.

A NEW SYNCHRONISM INDICATOR FOR ALTERNATORS.

BY FRED P. WOODBURY.

When throwing large alternate current generators in multiple, it is desirable to have them as near perfectly in phase as possible to prevent the welding of the switch contacts that is likely to occur if the machines are put together slightly out of step.

Mr. Paul M. Lincoln, resident electrician for the Niagara Falls Power Company, has devised an instrument that not only indicates exactly the synchronism of two machines to be paralleled, but also shows the relative speeds and the constantly varying phase difference between the machines during the process of bringing them into synchronism. The instrument is mounted upon a frame that resembles a fan motor, with a dial and pointer replacing the fan.

Fig. 1 shows a front view of the instrument, with the hand at the point of synchronism. Fig. 2 is a back view, with the rotor, one bearing and pointer removed and lying at the right. The lamp at the top is used for a non-inductive resistance; an inductance coil is placed in the base. A phase of each of the machines to be paralleled is connected to the four binding posts upon the base.

Fig. 1.—SYNCHRONISM INDICATOR.

Fig. 2.—BACK OF INDICATOR.

Both rotor and stator are built of laminated iron. The stator is bipolar and has winding with a sufficient number of turns to produce a strong magnetic field. The rotor is a drum-wound armature having upon it two coils set at right angles to each other. Three slip rings are fitted upon the shaft that connect the coils to the external circuits through suitable brushes. The shaft rests in ball bearings.

In Fig. 3 F' is the stator with the coil, F, upon it. G and H are the two rotor coils that revolve in the field of F'. The R's are the slip rings and brushes. An end of each of the coils, G and H, is connected to the middle slip ring, and the remaining ends of the coils are connected to the other two slip rings. In series with coil, G, is an inductance, K, so proportioned as to produce a lag of the current in coil, G, approximately 90 deg. behind the current in coil, H. An ohmic resistance, L, is placed in series with coil, H, sufficiently great to make the currents in the two coils equal. The leads from K and L then unite.

To use the synchronism indicator the leads from the stator are put upon a phase of one of the machines to be paralleled, and the rotor leads connect with the corresponding phase of the other machine.

When the machines are in synchronism, coil G will stand at right angles to the field of F', and when the machines are in opposition, coil G will still be at right angles to F', having turned 180 deg.; thus the rotor will take up intermediate positions between these two extremes corresponding to the constantly varying phase relations of the two machines, and the pointer, moving over the dial, will indicate to the attendant the necessary procedure to bring the machines into synchronism.

Mr. Lincoln has made several instruments in the power company's workshop.

A New Electromobile Record.

The well-known French chauffeur and manufacturer, M. Kriéger, on the 16th of October last broke all records for long-distance runs in electric automobiles. M. Kriéger, accompanied by Georges Prade, traversed the distance from Paris to Chatellerault, 307 kilometers (190.6 miles) without recharging his battery. The journey was accomplished without accident in 15¼ hours at an average speed of 20 kilometers (12.4 miles) per hour.

Ever since the electric carriage ceased to be a curiosity, manufacturers have endeavored to increase the radius of action. As early as 1885, Trouvé succeeded in driving a tricycle by means of accumulators. In 1894 the electromobiles of Jeantaud and Kriéger were able to cover as much as 30 kilometers (18.6 miles) without recharging. The radius was rapidly increased. In 1898 electric cabs at a *concours* covered 60 kilometers (37 miles) with a single charge; and last year M. Garcin made a new record by covering the distance from Paris to Alesia, 267 kilometers (165.8 miles) with but a single charge of his batteries. It is this record which Mr. Kriéger has beaten.

The vehicle which performed this feat is an electromobile of 15 horse power, driven by 60 Fulmen elements grouped in series and weighing 1,250 kilogrammes (2,750 pounds). The weight of the carriage empty with the accumulators is 2,225 kilogrammes (4,895 pounds). The available voltage is 120; the capacity of the battery is 400 ampere-hours. The weight of the carriage ready for the road with two passengers is 2,500 kilogrammes (5,500 pounds). Six speeds are available, the last of which is used only in recuperating on down grades. The fifth speed on the level enables the chauffeur to cover a kilometer (0.621 mile) in 2 minutes and 15 seconds, or 26 kilometers (16.1 miles) in an hour. At this rate 28 to 30 amperes under a pressure of 120 volts were more or less constantly used. On gentle upgrades 35 to 40 amperes were required. Near Sainte Maure, a rather hilly country, the second and third speeds were used, with the result that the consumption rose to 60 and 75 amperes. After stopping at Chatellerault, the voltage rose to 105 volts, or 1.7 volts per element. At the start it was 154 volts, or 2½ per element.

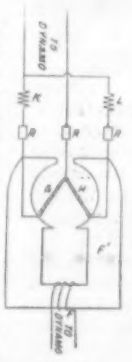


Fig. 3.

DIAGRAM OF INDICATOR.

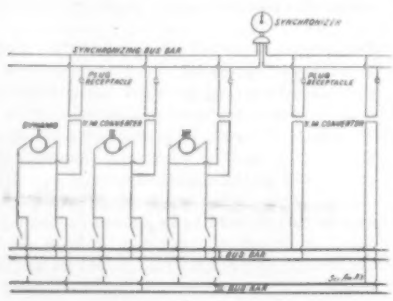


Fig. 4.

CONNECTIONS OF SYNCHRONIZER AS USED BY NIAGARA FALLS POWER CO.

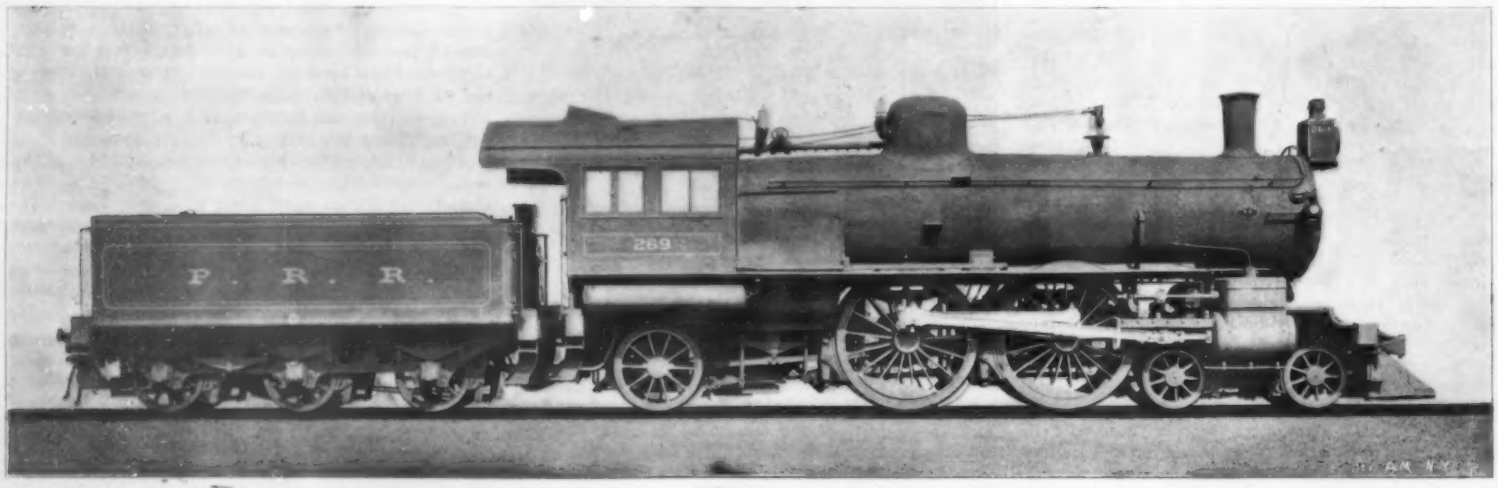
Fig. 4 is a diagram of connections of the synchronizer used on the switchboard of the Niagara Falls Power Company.

The phase relation between either machine and the power busbar may be found by merely inserting the proper dynamo and busbar plugs.

At the request of some of his professional friends, Mr. Lincoln has made several instruments in the power company's workshop.

NEW ATLANTIC TYPE OF PASSENGER LOCOMOTIVE ON THE PENNSYLVANIA RAILROAD.

The Pennsylvania Railroad Company has recently brought out a new fast passenger locomotive, which is shown in the accompanying illustration. It is of the well-known Atlantic type, which is becoming very popular for express service, especially where it is desired to haul heavy trains at high speed. The advantage of the type is that by placing the two driving axles forward of the firebox and carrying a trailer beneath the latter, it is possible to use a firebox of large dimensions and secure the increased boiler capacity resulting therefrom. This engine may be compared with the new Atlantic type of express engines which is now working the fastest expresses on the New York Central & Hudson River R. R. It is not so large or powerful as the latter, especially as regards its boiler. It has a maximum heating surface of 2,640 square feet, as against a maximum of 3,500 square feet in the New York Central boiler. Like all the locomotives, and particularly those for express service, turned out by the Pennsylvania Railroad, it is a very handsome design. It will be noted that it has the six-wheel, rigid base, type of tender, which seems to be favored by this company. The cylinders are 20 inches in diameter by 26 inches stroke. The weight on the drivers is 53,800 pounds on the first pair and 55,233 on the second pair; the weight on the truck is 36,650 pounds; and the weight on the trailer is 30,917 pounds, making a total weight for the whole engine of 176,600 pounds. The total length of the engine and tender is 70 feet 8 inches, and the height of the center of the boiler above the rails is 9 feet 3 5-16 inches, while the top of the stack lacks only ½ inch of being 15 feet above the rails. The boiler has a heating surface in the firebox of 166 square feet, and in the tubes of 2,474 square feet; making a total of 2,640 square feet for the whole boiler. The grate area is 55.5 square feet and the steam pressure is 205 pounds to the square inch. The tender, as noted above, differs from the standard American type, having only three rigid axles in place of the customary two four-wheeled trucks. This is a modification of the standard English tender; but it has the advantage that the springs of the two rear axles are compensated.

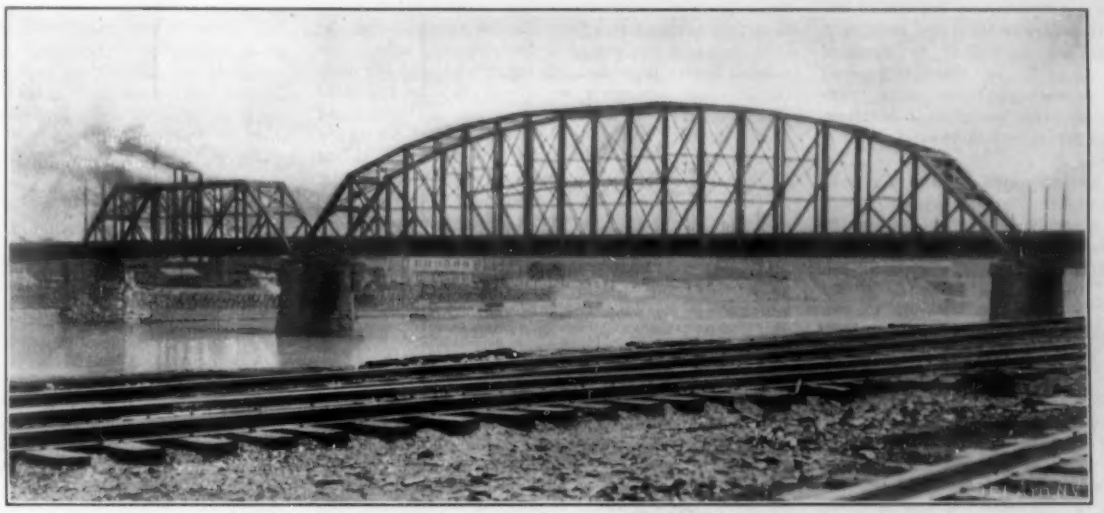


Cylinders, 20 inches diameter by 26 inches stroke; heating surface, 2,640 square feet; weight on drivers, 109,033 pounds.

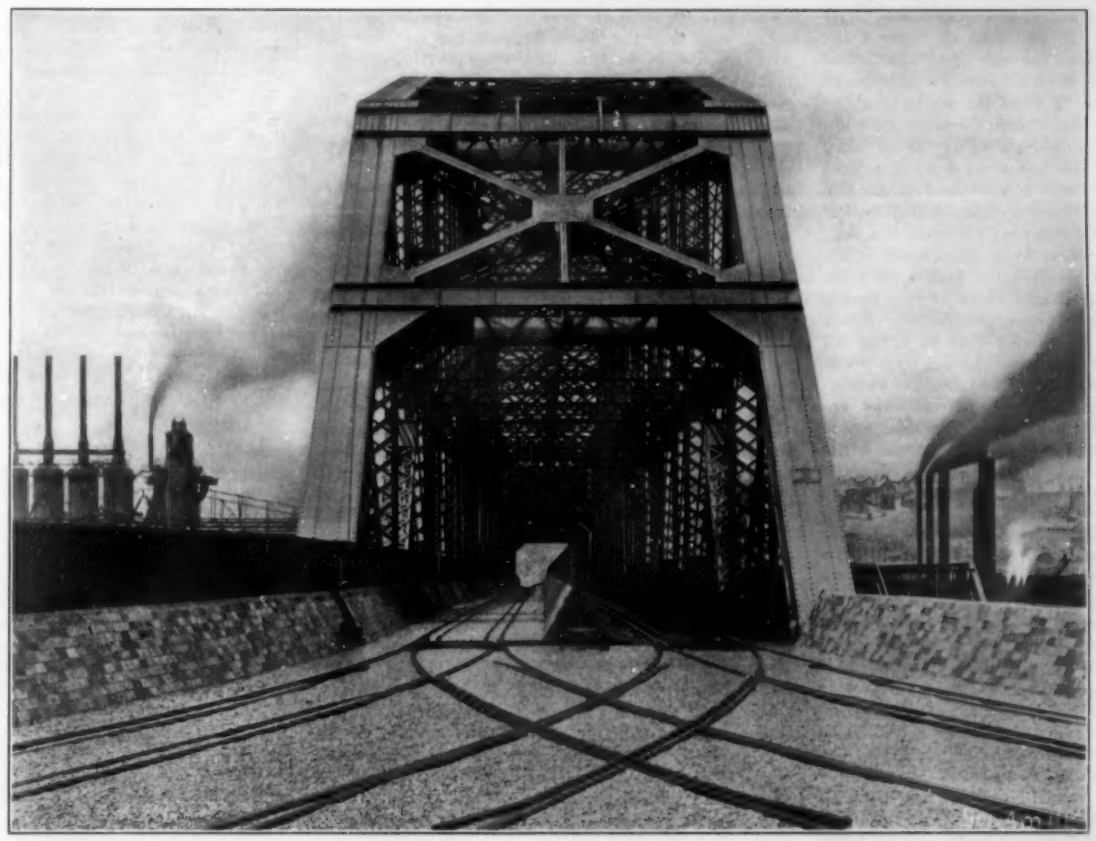
NEW ATLANTIC TYPE PASSENGER LOCOMOTIVE FOR THE PENNSYLVANIA RAILROAD.

RANKIN BRIDGE FOR THE TRANSIT OF MOLTEN IRON.

The massive and handsome bridge which forms the subject of the accompanying illustrations was built over the Monongahela River, by the Union Railroad Company, for the purpose of bringing ore and other furnace material into the Carrie Furnaces at Rankin, and also to enable hot metal in ladle cars to be transported from the Carrie Furnaces to the Homestead Steel Works, both of the Carnegie Steel Company. The general plan of the bridge, which was erected in 1900, was prepared by Mr. W. H. Smith, the chief engineer of the Union Railroad Company, but the bridge proper was designed by, and erected under, the direction of Mr. Emil Swensson, at that time chief engineer and superintendent of the Keystone Bridge Works. We are indebted to both of these gentlemen for courtesies extended in the preparation of this article. The crossing of the Monongahela consists of two truss spans, one 252 feet in length and the other, over the main channel of the river, 500 feet in length, with two approaches, one 856 feet, and the other 286 feet in length. The chief interest of the structure centers in the great 500-foot span, not so much on account of its length (for longer fixed truss spans than this have been built) but on account of the great weight of the truss itself, the total weight of steel amounting to about 2,800 tons, or 5.6 tons per foot. This is considerably the heaviest double-track span of its length built to date. The great weight is due, partly to the extraordinarily heavy freight locomotives, and the large capacity of the steel cars, used by the Union Railroad, and partly to the special system of roadway protection for the bridge which has been rendered necessary.



One 252-Foot and One 500-Foot Span; Weight of Larger Span About 2,800 Tons.



Portal View of the 500-Foot Span, Showing the Massive Character of the End Posts and Web Members, and the Fire-Brick Protection Against Molten Metal.

THE RANKIN BRIDGE FOR TRANSPORTING MOLTEN METAL ACROSS THE MONONGAHELA RIVER TO THE HOMESTEAD WORKS.

For the protection of the steel in the bridge against the cutting action of the molten iron, and also to protect the boats passing up and down the river from any molten metal that might splash over in transporting the ladle cars, the downstream track was fireproofed.

The construction of this fireproofing consists of putting I-beam joists on the stringers, and completely covering said joists with steel plates, on which plates the rails are fastened. These plates are extended first on a 45 deg. angle, and then vertically, as a fence, about 8 feet above the rail. The floor plates are then lined on the inside with fire bricks, said fire bricks extending to the top of the 45 deg. incline. The horizontal surface of the fire bricks is next covered with fine gravel, almost to the top of the rails. This makes what is called the hot-metal track, or route, between the Carrie Furnaces and Homestead Steel Works, the object of which is to take the molten iron quickly across to the open-hearth furnaces at Homestead, and then convert it into steel, without loss of the heat in the molten iron; this, of course, saving the remelting of the iron. It will be seen from the photograph showing the portal of the bridge, that at the Homestead end of the structure the tracks diverge, directly at the end of the 500-foot span, forming a Y. Each leg in the Y is single-tracked, but is connected with both tracks on the span; the entire bridge, from this point, being double-tracked. The tracks on the Y are on sharp curves, and also on grade, which, together with the system of switches, at the end of the span, made it a rather complicated steel construction at this point.

On the curved portion of the viaduct at the Rankin end, the steel construction carrying the hot metal had to be made of dimensions to suit the fireproof protection, inasmuch as the fences had to be spread to proper distances to permit the passing of the cars.

Consul Hill reports from Amsterdam that the necessity for United States manufacturers to adopt the metric system in foreign trade becomes daily more imperative. A firm in Holland received this week a cable offer from New York for 2,000 barrels of potatoes. As this was a new business, the question at once arose how many pounds were there in a barrel of potatoes—American pounds, too, as the Dutch pound differs from ours. A whole day was lost before the answer could be wired. Had the offer been made in kilogrammes, every business man in the commercial world from Vladivostock to Mauritius would have understood it instantly.

Electric Discharge and Capillary Action.

M. S. Lemstrom has made some interesting experiments to show the effect of electric discharge upon capillary action. A capillary tube is plunged in a vessel of water, and the latter is connected to one coating of a Leyden jar. The other coating is connected to earth, and the coatings are also connected to the two balls of a spark micrometer. Above the tube is placed a metallic point which is joined to one pole of an influence machine, the other pole of the machine being grounded. The discharge thus passes from the point across the air to the water. When the point is joined to the positive pole the meniscus is seen to rise along the walls of the tube and at the same time one or more minute drops of water are formed at the edge. The result is not always the same as regards the number of drops which are formed in the same interval of time, even when the intensity (as measured by the number of sparks) is the same. When the point is raised to a considerable distance above the water, this phenomenon is still observed, but the drops cease to form at a distance of 30 inches, after which the meniscus still continues to rise, however. The quantity of water thus raised depends upon the amount of discharge, the distance of the point from the water, the diameter and length of the tube and the various resistance of the circuit. It seems to be proportional to the time during which the discharge passes, at least in the first instance. Diluted solutions of various salts act in the same manner as water, but the quantity raised is smaller. As may be expected, the discharge has also an action upon the capillary tubes of plants and this the experimenter shows by placing above the capillary tubes of the plants a sheet of wire gauze provided with small points. The machine is connected to the gauze and to earth. He finds that the activity of the plant is increased when the gauze is joined to the negative pole of the machine, in which case, as above, the discharge tends to favor the rise of the sap in the capillary vessels of the plants.

The Current Supplement.

The current SUPPLEMENT, No. 1353, has an interesting article devoted to shell experiments, "Recent Experiments in Attacking Armor with High Explosive Shells." "Liquid Hydrogen" is by Prof. Dewar. "Enameling—V" is continued. This is the most important series of papers on the subject ever issued. "Arc Lamps for Blue Printing" describes a new use for the electric light. "Pictet's Oxygen Separation Process" is accompanied by an interesting diagram. The usual Trade Suggestions from United States Consuls and Trades Notes and Receipts are published. The first part of the "Report on the New Croton Dam" is given.

THE MANUFACTURE OF OIL-CLOTH.

The manufacture of oil-cloth is an industry which is carried on with the aid of very simple machinery—machinery so simple, in fact, that it is seldom out of order, and the costs of repairs are trifling. The buildings in which the operations of making oil-cloth are performed are constructed on an entirely different plan from large machine shops, the tendency being to minimize the ever-present danger of fire by locating the different steps of the industry in as many buildings as possible and isolating them. The plant which we illustrate is that of Alden Sampson & Sons, and is situated on the crest of a hill in a suburb of the old city of Brooklyn known as Fresh Pond. The buildings and grounds are twenty-six acres in extent. The various drying houses are separated by a series of great buttressed firewalls which sometimes form the end of one of the buildings, but are generally separated from each building. These walls are perforated by fireproof doors, which permit of rolls of oil-cloth passing through them on the elevated platforms called "railways." Should a conflagration occur in a building, sprinklers and fire pumps are automatically operated to extinguish the flames.

Oil-cloth consists of burlap which is painted repeatedly with a body color, and then printed with a pattern consisting of two to ten colors. The burlap, which comes from Scotland, is brought to the factory in bales containing twelve to fifteen bolts of one hundred and fifty-two yards each. Burlap used is made in six widths, 38, 47, 56, 74, 75 and 93 inches wide, though for special use it is made narrower, as for stair oil-cloth. The bolts of burlap are sewed together by women in the basement of one of the buildings, in order that a large roll may be obtained to be sized and dried. One of these rolls is seen at the right of our first interior view. The object of the sizing is to stiffen and give a surface which will take the paint, and in the cheaper and lighter varieties of oil-cloth the back is not painted, therefore in this case the size is dyed. The size is made on the floor above, and is allowed to flow while hot into the vat through the spout shown on the right of the engraving. The burlap passes under a roll in the bottom of the vat, then up under a bar known as a "knife," around the pair of rollers, and is finally wound on a great bobbin. Five of the bolts of cloth form a single roll. Beyond the sizing machine is a blower and air heater, which furnishes an enormous volume of hot air to be used in drying the sized burlap. The wet rolls are taken to a room on the floor above which immediately adjoins the drying room. Here they are pulled forward by pins which are attached to endless chains, and pass underneath a sash of a window and out on an iron framework, which is boxed in, and which receives the heated air from below. The burlap makes three turns of this drying arrangement, which is 60 feet long. As the temperature in the room is 220 deg. F. no men work in it, but the course of the cloth may be watched through windows at either end, one of which is shown in our third engraving. The calendering rolls and the endless chains are operated by a two-cylinder engine shown at the right of the engraving. As the burlap emerges from under the window-sash, it is automatically marked into lengths and then passes over three calender rolls which are heated by steam, which press and iron it. The burlap is then drawn from the calenders by tension rollers and is cut off into lengths and rolled up.

These pieces of cloth are then taken to the buildings where the body color is put on. There are three of these buildings, each very large, being usually five stories in height, and wide enough to permit of a considerable number of racks on each floor. All the paint used is ground and prepared on the premises, the linseed oil being kept in two large iron tanks in the yard holding 250,000 gallons. The paint is brought to each floor in tubs, which are wheeled to the painting machines which are shown in our engraving. These painting machines are of the utmost simplicity and are very effective. They move across the width of the building on a track, in order that they may be brought in front of each row of racks, for after the burlap is painted, it must be allowed to dry in a rack by itself out of contact with other pieces. The racks are built of yellow pine, and a considerable portion of the floors of the buildings are likewise slatted to allow of a free circulation of air. At night steam is turned on to assist the drying, and sometimes in cold weather steam is used in daytime. The roll of sized and dry burlap is put on a reel, shown at the right of the painting machine, and it then passes over two pads and under two knives. The paint is thrown onto the burlap by dipperfuls, the knife distributing it evenly. The piece of cloth, after being painted, is pulled onto one of the racks, which are each 76 feet long, and there are twenty-four tiers of them on each floor, and the buildings have generally seven ranges. In all there are 5,533 drying frames, aggregating 276,000 square yards of space. The end of the oil-cloth is secured by a clamp, which is shown resting against the painting machine. A rope is attached to this and threaded through the proper slats in the drying frame by a workman who walks through a narrow hallway between each pair of racks. The end of the rope is brought out and three or four turns taken around the winch-head shown in the middle of the picture. The speed is adjusted by friction, so that the cloth is pulled steadily through the painting machine at the proper speed. When the entire twenty-four pieces of cloth have been painted, the machine is moved sideways until the next rack is reached. Considerable frictional electricity is generated at the painting machine, and a wire at the top conducts it to the ground. The paint on the cloth dries in the space of a day or so, and the cloth is then rolled up and taken to a rubbing machine, which forms the subject of our next engraving. It consists of a pair of parallel bars which are actuated in opposite directions with the aid of gears and cranks. Each bar carries a number of pumice-stone blocks, which serve to smooth the surface as the painted burlap is drawn through it. Sand is also thrown upon the cloth to assist the action of the rubbing blocks. The painted burlap is rubbed after each coat, and the number of coats depends upon the grade. In the most expensive oil-cloth four coats are given on the face and two to the back, and as it requires a day or so between each step, it will be seen that a considerable period must elapse before the oil-cloth is ready for printing. In the cheapest oil-cloth one coat is given to the face and none to the back. The edges are trimmed before printing.

Oil-cloth may be printed both by hand and machine, hand work being used for the heaviest and best grades and for samples, but the machine work is faultless. The printing blocks are of three varieties, pin or line blocks, depending on whether the pattern is produced by incised lines or by separate wooden pins, and metal blocks. Pin blocks are made by taking a piece of maple and sawing it both longitudinally and transversely with a series of fine saw cuts which form small square pins; the ones not needed in the pattern are chipped out. In the line blocks parts of the continuous lines not needed are cut away. Blocks are required for each color, and some patterns require as many as six or ten colors. The machines are over 50 feet long, and the oil-cloth is fed in at the rear and is pulled forward 18 inches each time the blocks descend. As was the case with the painting machine, this entire printing machine moves up and down the room, in order that the printed pieces of oil cloth may be delivered to the different sets of drying racks. The printing blocks are secured to cross pieces of frames which move vertically with the aid of cams. The blocks are inked by rollers which run in boxes, the box being filled with paint. Each roller inks one block, which prints one color. In operation, with the aid of a so-called crooked wheel seen at the right in the machine in the background, the painted burlap is moved forward and at the same time all of the printed blocks descend, each printing its own color. Thus at the first block only one part of the pattern in one color will be printed, while at the last block the entire pattern of oil-cloth is completed. As the blocks rise, the ink roller runs under the blocks and inks them, rolls back from underneath, and the block descends again. On each pattern is a block called a masher, which is simply an uncut block with all pegs or lines left in place. This spreads and smooths the paint in descending.

As the printing progresses, the piece is drawn into the drying room. Owing to the fire underwriters' ruling, the buildings are kept isolated, so that in this case there is no direct communication between the printing room and the drying house. This difficulty is gotten over by a series of iron doors which permit of the piece of oil-cloth being drawn through them. Each time the machine is moved it is drawn in front of one of these doors. A movable house, one story in height, passes up and down, outside the building, and the oil-cloth is drawn through this movable house into the drying house. Once in the latter the oil-cloth can be raised to any floor through traps and is drawn through the racks as before. It requires from three to twenty days for the printed oil-cloth to dry. The oil-cloth is then rolled and dried again for a month or so.

Hand-printing is used exclusively for samples, and very largely for the heaviest oil-cloth. The principles involved do not differ from those in which the machine is used. The block, which is 18 inches square, has a handle and is linked upon a pad, the paint being supplied and spread with the aid of a bristle brush. Our engraving shows only the white paint on part of the cloth. After all of the colors have been applied, and a masher used to spread the colors, the oil-cloth is pulled forward 18 inches by a rope, and the next section is printed. The oil-cloth is pulled into the drying frames as before.

After the finished product has become perfectly dry and hard, it is taken to a varnishing room. The varnishing machine consists of a metal trough which holds the varnish. When it is turned down the varnish runs out of twenty spouts, distributing it evenly over the oil-cloth, which is rapidly drawn between a metal and a printer's roller, the latter spreading the varnish. Workmen with the aid of brushes serve to distribute the varnish. The oil-cloth is hauled into the drying racks as before. After it is entirely dry it is rolled up and stored with other rolls of its pattern in a warehouse. An open crate or shook is used in packing the oil-cloth for shipment.

Automobile News.

The Schweitzer portable bakery system, which has met with great success for army use, has lately made a combination with the automobile which increases its efficiency. An outfit of this type, designed by the Potel & Chabot Company, figured in the military maneuvers at Betheny on the occasion of the Czar's visit to France. This portable bakery has a mill attachment, and the bread is made on the spot from the grain. It first supplied the Thirty-first Regiment at Melun and then arrived on the field of the review at Betheny. At the close of the maneuvers a lunch was served to the Czar, President Loubet and the invited guests, and the small loaves of bread were baked on the spot by the apparatus. The system has already proved valuable in the army, and it will no doubt be more so when provided with the automobile method of propulsion.

The French Postal Administration is continuing its experiments in Paris with automobile postal wagons for collecting the mail matter with a view of replacing the old horse vehicles. This change has been contemplated for some time, and M. Mougeot, the Postal Director, who is quite in favor of the automobile system, has been carrying on a number of trials with different forms of automobile mail wagons during the past year; but it must be remembered that there are now as many as 400 of the ordinary wagons in service in the city, whose value is estimated at $360 each, as well as 1,200 horses, and the total outfit represents a value of $600,000. The post-office department will soon have four automobile wagons, two electrics, one gasoline and one alcohol. The latter was finished a short time ago, and is now on trial; it is of the Peugeot type, with a Longuemare alcohol carbureter. It uses the standard Leprêtre liquid, carbureted at 50 per cent.

Two or three years ago the British postal authorities carried out a series of experiments with a motor postal van for the conveyance of the parcel post between London and Brighton. The car selected for the task was the Lifu, but as it did not give entire satisfaction, the postal authorities abandoned the idea. Since that time, however, several improvements have been carried out in the propelling mechanism, and the Post Office is once more utilizing motor transport. The car selected for the arduous work is a Milnes lorry driven by a 6 horse power patrol engine. The road between London and Brighton is very rugged, and as the cargo of parcels carried every night is large and heavy, a powerful car is required. On a recent trial the lorry maintained an average speed of 10 miles an hour with a full load, as compared with 8 miles attained by the horse coach. If the scheme proves satisfactory, and the danger of breakdowns is averted, the Post Office will adopt the motor transport throughout its service.

The Semmering coasting race, organized by the Austrian Automobile Club, has been a very successful event. The Semmering, which is the last ramification of the Alps, is a picturesque mountain of 3,100 feet altitude which is only 50 miles from Vienna. The race starts from Schottwein, a small village situated at the foot of the mountain at 1,800 feet altitude, and is run over 6 miles of road with a total ascent of 1,200 feet. This makes an average grade of 4 per cent, but the slope is quite varied, as the grade commences slowly, but afterward becomes more and more steep until it is a hard climb for the machine. This is the fourth year of the Semmering races. The first two were won by Gasté and Marcellin, and the third by a Lohner-Porsche (electric). This year the previous record was beaten by a German machine of the Mercedes make, 35 horse power, piloted by Baron Richard von Stern. He covered the course in 12 m. 30 sec. The other records of the heavy machine class were a Mercedes 35 horse power machine in 13 m. 42 sec., a Serpollet steam automobile (with only a 6 horse power motor, however) in 14 m. 21 sec., and a Lohner-Porsche electric in 14 m. 29 sec. The voiturettes had an interesting struggle; these were represented by a De Dion of 6 horse power, a Darracq of 6½, and Blake (American) with a 4½ horse power steam motor. The De Dion came first in 18 m. 14 sec., which is a very good performance for this class. The Blake followed in 21 m. 13 sec. In the light vehicle class Edmond won on a four-cylinder Darracq (20 horse power) in 14 m. 35 sec. A second Darracq machine of 12 horse power followed in 15 m. 17 sec. In the motocycle class three De Dion machines were entered; the 8 horse power machine made 13 m. 22 sec., the 3½ horse power 17 m. 42 sec., and the 2¼ horse power 26 m. 37 sec. It may be remarked that the Mercedes (gasoline system) of the heavy machine class beat the record over this route and won over the steam and electric. The latter came first in 1900, but is last this year, although it has beaten its own previous record.

Correspondence.

An Agricultural Invention Needed.

To the Editor of the SCIENTIFIC AMERICAN:

Very many post-hole augers have considerable merit and are quite generally conceded, where nothing interferes, to do the work with greater ease and rapidity than can be done with a spade.

One important objection to these hand-augers is the difficulty in easily and successfully operating where holes are to be dug directly in line with a fence already up. Still another objection is that the holes dug are very often too small for posts as ordinarily made and sold, many of which are not straight. This very frequently happens and always will happen when oak posts are used.

Considerable experimental work would be necessary, no doubt, to perfect an auger of real practical worth.

I would suggest that the bit, possibly an extensible one, be set in a framework similar in construction to the framework supporting the carpenter's mortising auger. The entire frame should be supported on wide iron rollers and arranged so as to be quickly adjusted to unevenness of the soil.

The hole, say two to two and a half feet in depth, should be bored before removing the auger. A convenient device attached to the framework for the purpose of removing the sticky dirt from the auger while it is in motion is necessary. The auger could be forced in the ground in several ways, the real advantages of each to be determined by repeated trials.

I believe that the cost of manufacture of such a machine would be so moderate as to enable the patentee to secure reasonable profit. J. N. MUNCEY.

Jesup, Iowa.

Cable Laying in the Philippines.

To the Editor of the SCIENTIFIC AMERICAN:

My attention has been called to the interesting article in the SCIENTIFIC AMERICAN of November 23 by Mr. Frederick Moore on cable laying in the Philippines, which contains the following incorrect statement:

"The first work was done by the army, but subsequently contracts for the entire work were let for laying the cable as well as furnishing it. The government furnishes the cable ship, the necessary military protection, and an officer and inspector."

The entire work of constructing, maintaining and operating the very extensive system of cables and land lines in the Philippines has been exclusively done by the Signal Corps of the army, and not by contract. No corporation would undertake to lay these cables, as was set forth in my annual report for this year, as shown by the following extract:

"In cable matters, as in all other technical construction, the Chief Signal Officer follows the wise rule of relying on the skill, judgment and experience of the experts of the great manufacturing establishments, thus securing successful installation by experts whose lives are given to technical work. In Cuban and Philippine waters during war conditions it was necessary for Signal Corps officers to do the entire work. They have been most fortunate in their operations, as not a single mile of cable has been lost, either in laying or recovering, nor has there been any serious interruption in the working of these cables."

The error into which Mr. Moore has doubtless unintentionally fallen would be unimportant if it did not appear in a journal of scientific standing.

A. W. GREELY,
Brigadier-General, Chief Signal Officer, U. S. A.
November 22, 1901.

Latin the Universal Language.

To the Editor of the SCIENTIFIC AMERICAN:

I started a movement eight years ago to restore Latin as an international tongue of cultured people, Latin being an international tongue by the fact of its being taught in all secondary schools of the world. That graduates of colleges do not speak it is the fault of the methods and teachers. That the schools do not lead in practical things generally but flit about among fads, etc., I need not explain to you. It is the outsiders, practical people of thought and knowledge, who invent or lead great movements. There have been numerous attempts at devising a "universal language," but they all failed, because the products were no "languages." France, Germany, Austria-Hungary, and Russia are still at work agitating the same question. The English, unfortunately, cherish the idea that their language will conquer the field. This conceit, which only delights the ignorant (for he would need no learning and still win the prize, is one of the causes why England is so detested by all races. In the United States we have just closed a Pan-American Exposition with a sore failure. A Pan-American Congress is in session in Mexico city, which will also fail in the end, wrecked on the antipathies of the Latin nations against the Pan-Anglican aggressiveness. This country will never have a flourishing trade with the Latin races owing to the hatred against the obtrusive English. We therefore take the ground that all college-bred people ought to learn Latin to write and to speak, so that they could take places in the business houses as international correspondents and interpreters in Latin, instead of Spanish, Portuguese, French, German, Italian, Russian, Danish, Swedish, Hungarian, Dutch, Roumanian, Turkish, Japanese, Bohemian, Polish, Bulgarian, Greek, etc. All the hatred, misunderstanding, lack of respect for each other is due to this one fact. Let us in America take the field, let us curb our conceit, convince the Latin races of our unselfish good-will by formally adopting the principle of Latin as a neutral language for international communications, to be developed in our schools in the next ten years. The United States will be the idol of all races and nations, and her example will be promptly followed by all.

ARCADIUS AVELLANUS.

Philadelphia, Pa., November 15, 1901.

Ice Manufacture in India.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of August 3 last I see a most extraordinarily inaccurate statement by your correspondent, Mr. Giffard Knox, that ice made by the native Indian method (by evaporation in shallow porous earthenware pans or saucers during clear nights in the cold weather) was only invented by them *after* the advent of the freezing machines in the sixties of the past century. The method is, however, exceedingly ancient, older than known to any historian—in fact, the oldest known process of artificial ice-making in the world.

Moreover, his explanation of how the ice is formed is very incomplete. This is described in the "Encyclopædia Britannica," as follows:

"In the upper provinces of India water is made to freeze during cold clear nights by leaving it over night in porous vessels, or in bottles which are enwrapped in moistened cloth. The water then freezes in virtue of the cold produced by its own evaporation or by the drying of the moistened wrapper. In Bengal the natives resort to a still more elaborate forcing of the conditions. Shallow pits are dug about two feet deep and filled three-quarters full with dry straw, on which are set flat porous pans containing the water to be frozen. Exposed over night to a cool, dry gentle wind from the northwest, the water evaporates at the expense of its own heat, and the consequent cooling takes place with sufficient rapidity to overbalance the slow influx of heat from above through the cooled dense air or from below through the badly conducting straw."

This action depends solely on the rapid radiation of the heat from the ground during the night (analogous to and an extension of the formation of hoar frost from dew). Like the formation of dew and hoar frost, it is completely stopped by clouds overhead. Hence his unexplained allusion to the east wind, which in upper India (Bengal to the Punjáb) is a muggy, cloud-bringing wind, being really the southerly winds from the Bay of Bengal deflected westward by the Himalaya range of mountains. The northwest wind is the cold dry wind, which blows steadily in the winter months except during atmospheric disturbances.

Mr. Knox talks about salts being sifted into the water to be frozen. This is not so; it would spoil the freezing altogether.

He also attributes an explanation of the process to the Indian icemakers, which they certainly would not give, being quite too ignorant of natural science to be capable of saying what is put into their mouths by him, but which he has clearly clumsily copied from the explanation I have given.

CORNELIUS E. CARDEW.

Insein, Burma.

Telephoning the Hospice of St. Bernard.

Mr. John W. Gates, of the U. S. Steel Corporation, tells a story about a friend of his who went into the Alps last summer, says The Electrical World. "My friend began the ascent to the hospice of St. Bernard," said Mr. Gates. "When about an hour's climb from the pass he was stopped by a dense fog. He waited gleefully, expecting to be rescued by the dogs, and so be able to come back to us with a thrilling story. The dogs did not come, however, and the fog partly lifted, so he resumed his climb, and finally arrived at the hospice, where he was welcomed warmly by the brothers. His first question was:

"'Why did you not send the dogs out in so dangerous a fog?'

"He nearly dropped from his chair when one of the brothers said:

"'You did not telephone us.'

"'Telephone you?' he ejaculated.

"'Yes,' was the answer. 'You see, shelters have been built all along the climb, and each shelter has been provided with a telephone. If a fog comes up all one has to do is to go to the nearest shelter and telephone. We immediately send a man and dog to that shelter. The dog carries bread, cheese and wine. As we know at just what shelter the climber is, no time is lost in looking for him.'"

Mr. Gates says his friend was so disgusted with having his romantic notions knocked in the head that he left Switzerland at once.

The Leonids.

BY EDGAR L. LARKIN.

The Leonid meteors were in magnificent flight as seen from this observatory on the morning of November 15. The first meteor was seen at 11:55 P. M. November 14, and the last at 5:40 A. M. November 15, 1901, in Pacific or 120 deg. time. Here is a table of times and rates:

From	Times.	To		Number of Meteors Observed.
	P. M.			
11 h. 55 m.		0 h.	November 14 to 15	4
	A. M.			
0 h.		1 h.	November 15	26
1 h.		1 h. 54 m.	"	27
2 h. 43 m.		3 h.	"	19
3 h.		4 h.	"	173
4 h.		5 h.	"	297
5 h.		5 h. 40 m.	"	109
345 Minutes.			Total	661

Rate 1.9 meteors per minute.

From 1:54 to 2:43 a cloud that suddenly condensed over the peaks of the Sierra Madre chain obscured the entire area of Leo. It remained 59 minutes, when it as suddenly vanished. A few meteors were seen straggling out of the edges. These were not counted. From 2:43 to dawn the sky was exceeding clear. The altitude of the observatory is 3,420 feet. East is Robio Cañon, 670 feet in depth, and rising from a distance 2,000 feet east of the observatory are three peaks in altitude 3,750, 3,900 and 4,216 feet. So that Gamma Leonis rose above these summits at 42 minutes, Regulus 49 minutes, and Denebola at 1:39. The meteors seen before the rising radiant appeared came over the cliffs on a tangent line. At first the rate was one meteor in about two minutes, then one per minute for some time. From 4 to 4:20 the rate was five per minute. General trend was from Leo to west and southwest. Few went north. About twenty met were bright as Venus. Estimate: Fifty bright as Jupiter, twelve say five times Venus; three, ten times; two, twenty times the brilliancy of Venus, and forty brighter than Jupiter. From fifteen to twenty equal Sirius, a dozen perhaps equal Rigel and Aldebaran, while two were extraordinary. They were numbered, the numbers being written at instant of apparition. Slightly less than half by estimate had trails. Color of the vast majority was white. Few greenish-blue, thirteen tinged with red, two full red, and a few yellow. The small meteors had slow motion compared to the large. All the large and brilliant had high speed, and seemed to be at greater altitudes than the small.

Some appeared to be aimed at peaks west of the dome, and others dashed madly to the sea beyond. These effects were due to perspective, the meteors really being at great altitude, when they were disintegrated into cosmical dust, requiring days to reach the earth. The greatest number seen at once was at 4:05, when six were observed, all southeast. The meteor from Spica to Mercury was large and had a trail, which must have been bright to show in the advancing solar glow. The most rapid fall was from 4 to 4:20. Many observers saw the shower from Pasadena and Los Angeles.

Mount Lowe Observatory, California, November 18, 1901.

Russia's Canal Plans.

According to the Odessa correspondent of The Times, the Russian government is considering the construction of a gigantic waterway from Riga, in the north, to Kherson, near the mouth of the Dnieper on the Black Sea. It is believed that large sums have already been spent at Kherson, which is eventually to be the terminus of a grand canal system joining the Baltic and the Black Sea. The correspondent says that, apart from the strategic importance of such a canal, it would be of enormous value to the agricultural and industrial interests of the vast empire.

For some time past attention has been directed to the exposed condition of the harbor at Monaco, in the south of France, to the southeasterly winds, and the consequent insecurity of the anchorage therein during these gales. To surmount this grave disadvantage a new mole has been begun. It starts from the Pointe St. Antoine, the eastern extremity of the fortress rock, and will stretch eastward across the harbor for 200 yards, terminating opposite the Hotel Hermitage. The undertaking, which is being entirely defrayed by the Prince of Monaco, will cost $750,000, and is to be completed within three years. When completed the harbor will afford perfectly safe anchorage in all weathers.

THE NEW DRAINAGE AND SEWERAGE SYSTEM OF NEW ORLEANS.

BY FREDERICK MOORE, C.E.

New Orleans is undergoing an upheaval. It is in the hands of the purger. The cleansing of its heart and main arteries is about done, and the work on its lesser arteries has just begun.

New Orleans is the last large city to install drainage and sewerage systems, and how it has gotten along to this time without them is a miracle. The installation there, however, embraces some of the most difficult engineering problems in this line that have ever been attempted, and some engineers have said the city could never be drained thoroughly. This has been given as the excuse for its not having been undertaken earlier; but the real reason is that the funds have never before been forthcoming. This work has been greatly assisted by the experience in drainage of other cities, and the installation of the latest pumping machinery, more of which latter enters into the New Orleans system than into that of any others in the world.

In 1894 a board was appointed which drew up plans for a drainage system to cost $8,000,000. Bonds were issued for a part of this sum, contracts let, and by 1897 work began on the first section, comprising the heart of the city. The yellow fever epidemics of 1897, '98 and '99 were the prime cause of a further bond sale in 1900 of $12,500,000, in order to complete the drainage and install a complete sewerage system.

The Old Basin—One of the Open Drainage Canals.

On July 30 of this year, contracts to the amount of a million dollars were let on the second section, and last week, under these contracts, ground was again broken.

The quantity of drainage to be dealt with in New Orleans is unequaled except, perhaps, in some of the East Indian cities. There is an annual rainfall of 5 or 6 feet, a monthly fall of 15 or 20 inches, a daily fall of 4 or 5, and a fall, for a few minutes, at the rate of 6 inches per hour. The conditions for delivery are still more unfavorable. The city is built on an alluvial plain, six miles in width, lying between the Mississippi River and Lake Pontchartrain. The plain has a slope from the river back of about 15 feet; all of which is consumed in the first three miles and most in the first half mile. Between the foot of this slope and Lake Pontchartrain, after a slight rise, is a level swamp. It is out of the question to drain into the river on account of the cost of lifting the great volume of water to such a height, the river at high water being 17 or 18 feet above the lowest point in the city. It follows from these conditions that the capacity of discharge for the drainage canal must be secured by size, not slope, and accordingly some of them at the discharge ends will have a width of 25 feet, a depth of 12 and a cross section of 175 square feet, so as to give the necessary discharge of 1,200 feet per second. It is intended to keep them pumped free of water, so that when a rain storm occurs they will first serve as reservoirs and afterward aqueducts to the pumps. Under ordinary circumstances they will be empty except for the daily flow from seepage and the contribution waters undefiled by sewage; which under no circumstances, could be relieved by the drainage system. It is possible for the drains in time of drought to go for weeks and even months without being flushed out. In contrast with the immense volume of drainage, the sewage of the entire city is but about 20,000,000 gallons per day, or 30 cubic feet per second. If this small volume was divided among the several drainage canals, it would just trickle over the sides and remain (in dry weather) at the bottom, to go through the process of oxidation, and generate poisonous and obnoxious gases within the city. To discharge the sewage, like the drainage, into Lake Pontchartrain would pollute that body of water. Consequently an entirely separate system, which will pump the sewage into the river below the city, is essential.

One of the Small Pumping Stations Lifting Water Out of the City After a Rainfall.

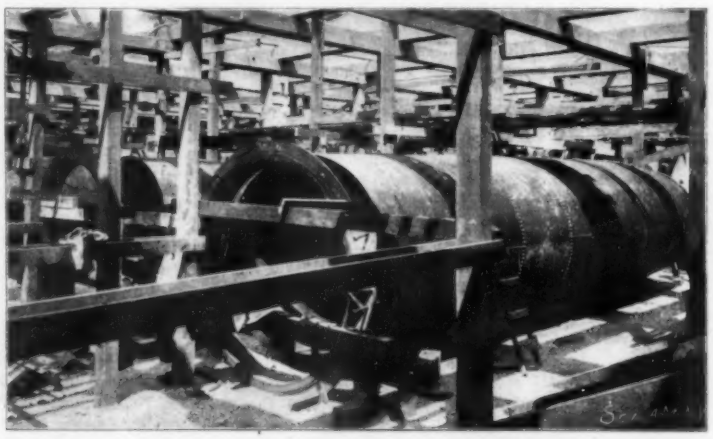
The lowest part of the city is Broad Street, which runs parallel with the Mississippi about three miles back from it. It is about 15 feet below the river bank on one side, and 5 feet below Metairie Ridge, which runs parallel with it on the edge of the swamps, on the other side. It is about a foot and a half below the level of the Gulf of Mexico. The drainage plans will take advantage of this feature, and collect the drainage into a main canal on Broad Street by a system of laterals on each side. These laterals are, of course, lined and covered, as is also the Broad Street canal within the city proper; for they are under, and their massive brick and concrete walls and steel arches hold up, the streets of the city. The laterals have, at intervals, branches parallel to the river and at right angles with them to intercept the flow of the gutters running back from the river. One of the most apparent defects in the present system (if it can be dignified with that term) is that these gutters extend from the river to the swamps without any increase in dimensions and with a constantly diminishing slope. The new system will break up these long leads by the intercepting branches.

When the drainage is collected into the main canal, though it now drains (the portion that is completed) into Lake Pontchartrain, it will be carried on down below the city and pumped into Bayou Bienvenu, an artificial stream large enough to accommodate small schooners, from which it will flow into Lake Borgne.

Lake Pontchartrain is practically surrounded by land. It has but one narrow outlet into Lake Borgne. Lake Borgne is about treble the distance from the city, and has very few pleasure or summer resorts on its shores, and it is but a vast arm of the Gulf of Mexico.

At times, however, the volume of drainage is so great that its total disposition in this direction is economically impracticable; and as, at such times, from its extreme dilution, the water is practically unobjectionable, the plan contemplates, when the amount is too great for the pumps leading to Lake Borgne to handle, to discharge the surplus at three different points into Lake Pontchartrain. As the main canal is not completed as far as Bayou Bienvenu, the drainage now carried off by the new system is pumped into Lake Pontchartrain.

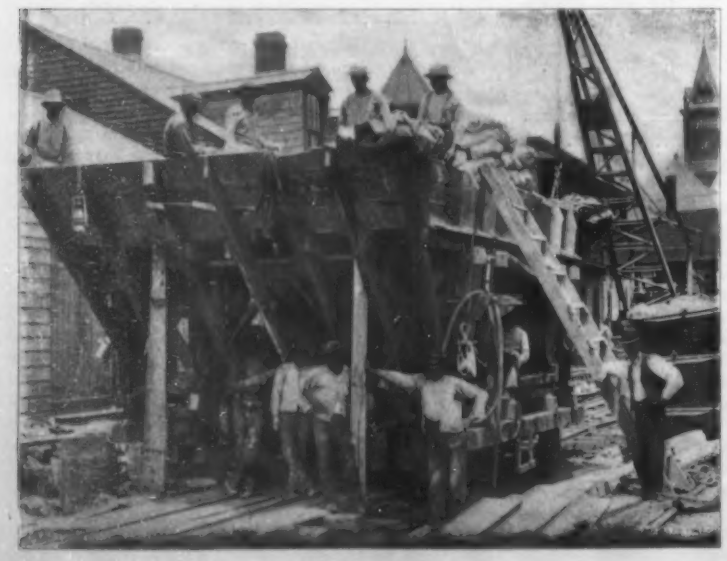
A central electric power house, with a capacity of 10,200 horse power, and nine pumping stations will be required to operate the drainage system. The power house and three stations have been completed.



Some of the Large Drainage Pipes.

The completed stations relieve the city directly, that is they pump from the drains of the city proper into the open canals that lead to Lake Pontchartrain. The other stations will be along the main canal to Bayou Bienvenu. As it is impossible to send the water in one flood to the bayou and then lift it over the levees of the bayou—for the lift would have to be too great and the excavations, to give the canal an adequate flow, too deep—the other stations will be at intervals along the main canal. The water will flow to one and be lifted to flow on to the next, lifted again, and so on to the bayou.

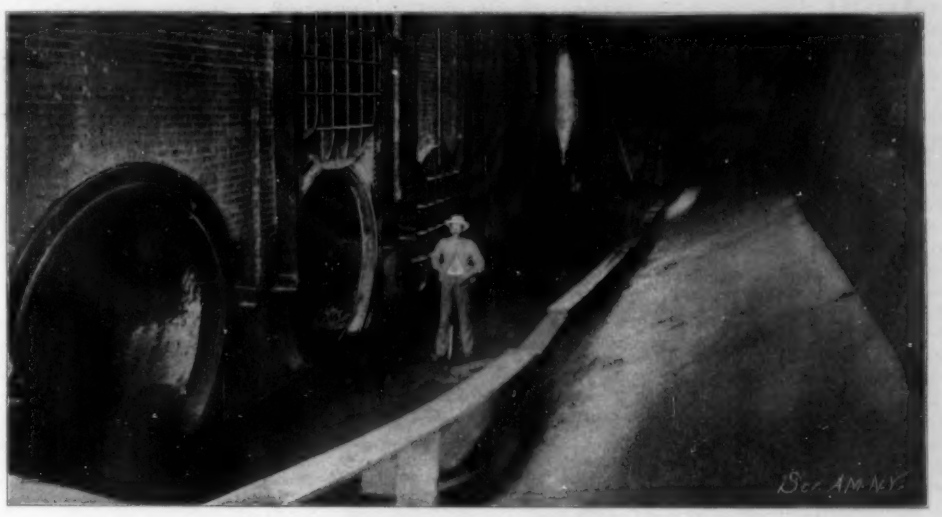
The old drainage system is a series of gutters on the surface of the streets next to the sidewalks. There is so little slope to them that when the heavy rains occur the streets are flooded. Much of the



One of the Movable Concrete Mixers.

THE NEW DRAINAGE AND SEWERAGE SYSTEM OF NEW ORLEANS.

water is seeped up by the earth. That which gets to the open canals on the broad streets in the rear of the city is lifted by a couple of old-fashioned paddle pumps, or rather swept by them, over the levees of two navigation canals that lead up into the rear of the city from Lake Pontchartrain. The pumps are inadequate for the relief of the city, and the gutters and canals drain only overflow waters. The rest remains in them stagnant until it dries up. It is a tremendous stride from these conditions to what promises to be the finest drainage and sewerage system in the world. The sewerage plans are not yet completed. Expensive tests and experiments are under way. It is expected that the work will be started early next year.



Sub-Surface Suction Pipes at End of One Section of Canal.

THE NEW DRAINAGE AND SEWERAGE SYSTEM OF NEW ORLEANS.

PORTRAITURE BY FLASH LIGHT

The professional photographer has always considered that nature discriminated against him in the distribution of the light which is so essential to him in his business. The season of the year when he is the most rushed with orders is in the winter time, and this is the time when his working day is necessarily very short. Four hours a day is the limit which is available for good work for his purposes, and any attempt to use the studio any longer than this is only done at a sacrifice of quality.

For a great many years it has been thought that the flash light powders would prove a means of extending his working day, but in consequence of the dirt and smoke resulting from the powder in burning the use of the light has been limited. The pictures made in this way are also generally harsh in contrasts. Then again, on account of the smoke, it would be necessary to open all of the windows and doors of the operating room after each exposure, and this, of course, greatly hampered the photographer in the progress of his work and at the same time made the room unfit for occupancy in cold weather.

A means of making use of the flash powder with safety and comfort has been devised by H. B. Shaeffer, of Altoona, Pa., and his system, which is shown in the accompanying cut, is now being introduced into a number of studios for use instead of the skylight. The flash light permits portraiture to be carried on in a ground-flour gallery, which is a luxury not often to be indulged in by the photographer located in the business section of a large city, on account of the value of the ground, and this is considered a great advantage in seeking custom. The greatest merit of this device, however, is the one of prolonging the photographer's day almost indefinitely, for he can take pictures as long and as late as he can get persons to come and sit in front of his camera.

A CONVENIENT FLASH-LIGHT APPARATUS FOR PORTRAITURE.

Another notable feature to be considered is the use of such a device in child portraiture. There are some children who are so nervous and restless as to defy the skill of the photographer and the lens maker to get a clear, sharp picture under the skylight, for although the exposure necessary under these conditions is but a second or two, this period is longer than a restless child can be kept absolutely quiet. A flash-light exposure occupies but the two-hundredth part of a second, which is a little too quick for any youngster.

Mr. Shaeffer's invention consists of a collapsible box, made of a fireproof material, which entirely incloses the flash. On the face toward the sitter, the material is of light weight to permit of the passage of the light; and in addition to the flashing apparatus, there is also contained in the box a half a dozen incandescent lamps, which alone are sufficient to properly light the model who is being posed before the lens. This enables the operator to see just exactly the effect he will get on the sensitive plate with the flash, and all being in readiness, a squeeze of a bulb in his hands opens the shutter of the camera, and at the same time elevates the flash powder into contact with an alcohol flame, causing the flash. The release of the bulb closes the shutter, thus completing the exposure.

The smoke which arises from the discharge is held captive in the cabinet, but it is disposed of by the operator, who, by a few turns of a wheel drives it out by the revolving fan into the open air through a tube leading to a convenient window. An electric fan can be substituted for the hand-propeller. There is absolutely no smoke or odor, and the room is at once ready for the next exposure. The pictures taken by this process are very soft and harmonious in their lights and shades, equal in appearance to those obtained by daylight.

Oil turpentine is an excellent medium for restoring the gloss to patent leather shoes, and satchels rubbed with it are made to look like new.

Novel Condenser in an Australian Electric Plant.

In a paper read before the Société des Ingenieurs Civils, M. Fouché describes a novel form of condenser which is used by a plant in the Kalgoorlie district of West Australia. In this region water is so scarce that it is paid for at the almost incredible rate of $5 per cubic meter (39.4 inches), and it is necessary to economize it to the utmost degree. The present arrangement is quite successful in saving practically all of the water of condensation, and it is thus used almost indefinitely. The Kalgoorlie mines, whose annual gold production reaches sixteen millions a year, have been heretofore provided with a number of large engines, but these were generally of the non-condensing type and worked under very unfavorable conditions. Consequently a light and power company was formed in order to furnish energy to the mines at less cost. The first plant of this kind has three vertical compound engines which give a total of 4,500 horse power. The condenser is provided with 27 ventilating fans which send two million cubic yards of air against the surfaces of condensation. These surfaces are composed of corrugated sheet steel, and the plates are assembled in pairs to form a corrugated flat chamber. The condenser is built up of a series of such hollow plates, which are joined to two conduits, one for the entrance of steam and the other for the water-discharge. The condensation is thus carried out under the best conditions. It is found that the plates do not deteriorate if they are protected from the weather, and the apparatus is easily kept in order. Owing to the hot climate the ventilators had to be made especially large and a great quantity of air be forced against the plates. The steam comes from the engines by a 24-inch pipe and passes first into nine oil-separators, then into the condenser, from which the water is taken by three pumps. An elaborate system of filters is used to render the water fit for use again in the boilers. Even the small amount of water coming from the separators is used, this being passed first through a charcoal filter, then through a sponge-filter. The condenser water, which is nearly pure, is also passed through a charcoal filter. In this way none of the water is wasted. The energy required for the 27 ventilators and 10 pumps is estimated at 120 horse power.

A new screw propeller, for which various advantages are claimed, has been brought out in England, and its merits were discussed at the meeting of the International Congress at Glasgow. Mr. Mumford said that he had experimented for twenty years with screw propellers of various pitches, but had never found one to give higher efficiency than a true screw. Also, that in propeller designing, no reliance whatever could be placed upon theory alone; the only course was to obtain better knowledge by actual practical tests; so far as he could see, there was not much hope of improving upon the screws now in use. These opinions are quite in line with those expressed to the writer many years ago by Capt. John Ericsson.

Patent Department

Process of Separating Pith from the Rind of Cane and Stalks.

Sorghum, sugar cane, cotton stalks, corn stalks, ramie, and cane in general contain a pith which is especially valuable for making pulp in the manufacture of fine grades of paper. But few systematic efforts have been made to separate this pith from the rind. In a recent patent taken out by Mr. Andrew J. Adamson, of Chicago, an intelligent attempt is described to separate the pith from the rind, so that the natural juices as well as the rind can be collected and utilized, and the pith or core reduced to a condition particularly adapting it for use in the making of paper pulp.

The material is first roasted or subjected to heat at about the temperature of boiling water. Green fibrous material, such as sugar or sorghum, is thus heated until the material is softened and the pith is loosened from the rind. A gummy substance, containing the impurities and injurious bacteria, exudes from the cane and is burned off or evaporated. This result is obtained in about ten minutes. The impurities are thus removed with a portion of the natural juices; the bacteria and other noxious matter are destroyed; about 50 per cent of the water contained in the juices is evaporated, and the core or pith is loosened from the rind. After the material has been heated, it is subjected to pressure and crushed so as to squeeze out the remaining liquid or juices. During the application of the pressure the rind is crushed or broken up, without, however, injuring the pith. The pith being in a heated and softened condition, is flattened into thin strips. The pressure also serves to effect a further detachment from the rind.

The material after having been subjected to pressure is thoroughly dried, in order to evaporate any remaining moisture. During this reheating and drying, the pith, which is of a spongy nature and which has been flattened into strips, expands, thereby aiding in severing the crushed rind. While being dried, the material is suitably agitated or beaten in order thoroughly to break up and comminute the rind and to disrupt any remaining ligaments which might otherwise cause adherence of the particles of the rind. The pith remains in long strips, unbroken by the process to which the rind has been subjected. The pith thus produced and separated is collected, and forms an excellent material for making paper pulp.

If sorghum or sugar cane be used, the natural juices expressed after the roasting operation can be collected and evaporated in the ordinary manner to obtain sirup, sugar, or vinegar.

TREATING FRUIT-TREES FOR SCALE.

There is probably no more deadly pest known to fruit-growers than the scale which infests many of the finest orchards of California. Innumerable efforts have been made to rid the trees of their destroyers; but the success which has been attained has not always been noteworthy. Mr. Isaac M. Clark, a fruit-grower of Lompoc, Cal., has invented a process which seems to be all that can be claimed for it. The accompanying reproduction of a photograph showing trees treated and untreated certainly demonstrates how efficient is this process.

The substances which are used in the process by which the trees are freed of scale comprise essentially any mineral oil, caustic alkali, and water. The mineral oil is sprayed upon the trees by means of a pump. The oil-spraying is then followed by the caustic alkali solution, applied in the same manner. The oil is intended to kill and destroy the scale and insects that infest the trees—a result achieved in from three to eight minutes. The caustic alkali solution serves the purpose of neutralizing the oil after the desired end has been attained; for without such neutralization the oil would destroy the fiber and foliage of the tree. The oil and alkali, it is found, form a paste of a soapy consistency, which paste is a fertilizer eminently advantageous to the life and growth of the tree.

TWO ROWS OF FRUIT-TREES, THE ONE TREATED FOR SCALE, THE OTHER UNTREATED.

A Phonograph Telephone-Repeater.

A telephone-repeater in which a phonograph is used is the subject of an invention patented by Harry I. Rhodes, of Denver, Colo. By means of a solenoid-actuated recording-tool a record is made on the phonograph, the recording-tool taking the place of the receiver or a repeating-coil. A tracing-tool impinging on the record transmits its motion by means of a multiplying-lever to a microphone. An ingenious arrangement of coils in circuit, to provide each line circuit with its respective recording and tracing apparatus to the repeating station, forms a feature of the invention.

IMPROVEMENT IN DREDGE SHOVELS.

The shovels ordinarily used in connection with dredging and ditching machines open at the bottom, and for that reason invariably leak. A considerable loss of the shovel-load is occasioned in traversing the distance from the point of excavation to the point of discharge. A new form of shovel which, when working in water, will not spill any portion of its load until the dumping point is reached, is the invention of Mr. Hiram Head, of Helena, Mont. Mr. Head's shovel is in the form of a can, open at its upper end and closed at all of its sides. The shovel is pivoted on the dredge beam by a pin, braces being employed to strengthen the pin and the beam. At the upper side of the dredge beam a bracket is secured, comprising two parallel cheek pieces between which a spring-pressed dog is pivoted. The dog serves to engage the upper edge of the shovel, holding it in the position shown in our illustration. The dog is operated by a tripping mechanism, comprising a rod, the lower end of which extends below the beam and which is joined to an arm pivoted on the underside of the beam. By pressing upon this second arm, the rod is raised, the dog lifted and the bucket allowed to tilt into its dumping position.

IMPROVEMENT IN DREDGE SHOVELS.

The beam with the shovel attached is operated in the usual manner. At the dumping point a post is located upon which the beam is lowered, so that the tripping arm beneath the beam may be pressed upwardly to release the dog and to permit the shovel to drop. The load when once in the shovel cannot possibly leak out and can be discharged only by the releasing dog. The shovel is particularly serviceable in collecting precious metals; for in the ordinary shovel, where there is a leakage at the bottom, much of the metal is lost, since by its weight it gravitates to the leaky bottom.

A great memorial will be erected in Europe to the memory of Eads, the engineer.

Brief Notes Concerning Patents.

According to a recent bulletin of the Census Office, there was one patent taken out in Connecticut in 1900 for each 100 persons. In 1890 the figures were one for each 796 persons.

William J. Gordon, an inventor of note, died recently at his home, No. 2450 North Broad Street, Philadelphia. He was born in that city in 1835, and during his business career he took out sixty-five patents for different mechanical contrivances covering principally the manufacture of tin and sheet metal ware. The corrugated rain spouts and awnings were his invention. He is said to have taken out the first patent covering the riveting of buttons on clothing.

A ten million dollar company has been organized at Trenton for the purpose of engaging in the business of making rubber shoes with the machine recently patented by Joseph Oliver Stokes. The entire operation is done by the machine, and the shoe is said to be turned out in a manner superior to those made by hand. The finish on the outside surface is so fine that it is not necessary to put the piece through the varnishing process, heretofore essential.

A kite for signaling from a wrecked vessel, and also to be used as a means of sending a line ashore, has been invented by Capt. Brossard de Corbigny, of the French Naval Reserve. It is collapsible and readily packed when not needed for use. When flown in the air it can be deflected at an angle of forty-five degrees from the direction of the wind. By this means a line may be flown over almost any desired spot. The line is dropped by sending aloft a little cutting device, which travels along the cord and is put into operation automatically when it touches the kite.

The diamond drill has added millions of dollars to the mineral wealth of the world. Its inventor, Ashel J. Severance, recently died poor at Denver, Col. In 1870 he and his associates sold the patent on the diamond drill for one hundred thousand dollars and Severance lost his part of the proceeds by ill-advised investment. At the time of his death he was about to realize considerable money on the sale of a patent for the manufacture of Damascus steel which he secured a long time ago, but on account of the great number of persons who have claimed to rediscover this secret, he found difficulty in interesting anyone in his process.

The American Consul-General at Vienna, Carl Bailey Hurst, reports that a committee composed of the leading manufacturers, members of the Vienna Chamber of Commerce and representatives of prominent corporations has held a meeting at which the idea of an International Exposition of invention and novelties to take place in Vienna, 1903, was discussed. The programme outlined has been enthusiastically received, and the scheme is well on the road to realization. All kinds of technical inventions, and in particular those already practically introduced, are to be exhibited. There will possibly be an inventors' gallery where workshops will be opened for public inspection.

John O'Neill, chief of the second battalion of the Detroit, Mich., fire department, has devised an invention to do away with the necessity of sending men up the ladders where it is desired to manipulate a stream from the top of an aerial truck, as is often necessary when working on fires on high buildings. This invention renders the ordinary aerial truck available for the work of the water tower, which is a very expensive apparatus. The invention consists of a ring set on a swivel and fastened to the rung of the ladder next to the top. The ring supports the hose nozzle by a clamp, and the ladder is swung up beside the burning building with the hose attached. By means of a rope and the ordinary adjustments of the ladder, the stream is under the absolute control of the firemen on the ground. It is possible to get closer to a burning building than would be otherwise possible. The device has been in very successful use for some time on the trucks of the Detroit fire department.

C. E. Havens, foreman of the Baltimore and Ohio shops at Zanesville, Ohio, has invented an adjustable side bearing to be used on railway cars, and by the use of this improvement a car has a greater clearance in rounding curves and less friction between the bolsters. It is therefore possible to place from six to eight more cars on a train. The value of this device has been demonstrated by practical tests.

The very latest invention of Cornelius Vanderbilt is a tank car which is especially adapted for the carriage of grain and oil. It is announced that a Western company is filling an order of five hundred of these cars for several railroads. They are built on the same principle as Mr. Vanderbilt's locomotive tender, which was exhibited at the Pan-American Exposition.

RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

CANE CARRIER AND FEEDER.—HARRY WICKS, Hawaii, Hawaii. The invention is especially useful for drawing the cane into the carrier, by which it is in turn delivered to the rolls of the sugar-mill. The device comprises a swiveled body portion in which a bar is mounted to reciprocate, the bar carrying a hook or hooks to engage the cane and drag it from one point to another.

SUBSOIL ATTACHMENT FOR PLOW.—BENJAMIN W. BRYANT, Roswell, Ind. The attachment is to be applied to a common breaking-plow for the purpose of plowing up the ground in the bottom of the furrow after the ordinary plow has gone throughout the furrow, leaving the loose earth in the bottom of the furrow to be covered by the earth thrown up when the ordinary plow makes the next furrow. The improved attachment is also provided with a pin arranged to break in case the attachment strikes an unyielding obstruction, thus avoiding injury.

Engineering Improvements.

BOILER.—ALBERT H. MACARTHY, Manhattan, New York city. Mr. Macarthy has invented a water-tube boiler in which he has endeavored to secure as perfect ventilation as possible. The tubes are expanded in both sheets of the boiler-heads and are pierced with openings in the water-legs formed by the head sheets. The tubes can be conveniently closed at the outside of the heads, the closing devices being readily removable to permit convenient access to any of the tubes.

AIR-FEEDING DEVICE FOR FURNACES.—CHARLES R. LITTLER, Selkirk, Manitoba, Canada. The invention is a device for feeding air to boiler-furnaces. A construction has been devised by which the amount of air supplied is automatically regulated according to the draft. The force of the draft is adjustable through the medium of the feeding device.

Motor Vehicle Driving Apparatus.

EXPLOSION ENGINE.—ARTHUR TOURAND, 34 Rue Dicquemare, Havre, France. For the purpose of avoiding the jars to which an automobile-engine is usually subjected, the inventor has devised a motor composed of two connected cylinders, within which two pistons are moved in the same direction to operate two fly-wheels geared together. Motion is transmitted to the driven part by one of the shafts upon which the fly-wheels are respectively carried.

VARIABLE-SPEED GEAR.—ARMAND WACHÉ and ALPHONSE KRIEGER, 195 Boulevard Voltaire, Paris, France. This variable-speed gear for motor-carriages includes pulleys whereby the rate of transmission between a driving and a receiving shaft can be varied at will without ever modifying the tension of the transmitting-belt. The pulleys are formed by an extensible rim, the members of which are pivoted together in parallelograms and fixed from distance to distance to supports radially movable. These supports can be displaced at will by means of two series of inclined guides, which series are capable of being brought nearer together or separated.

Mechanical Devices.

GRAIN-SEPARATOR.—WILLIAM S. CURRIER, Rosehill, Iowa. The separator is designed to separate long grain from short grain; for example, wheat from oats. The revolving cylinder, to which the grain is fed, is provided with longitudinal rows of hooks pointing in the direction of the rotation of the cylinder. The hooks are so spaced that the short grain will pass between them, and are so shaped that in ascending they will receive and retain the long grain and in descending will discharge the grain. A conveyer receives the long grain. A regulating-board at the mouth of the conveyer insures the delivery of the long grain to the conveyer.

COIN-SORTING MACHINE.—JOHN J. HOEY, Manhattan, N. Y. The object of the invention is to provide a machine which will be capable of quickly sorting coins of various denominations so as to save a large amount of the time required for the process of sorting by hand. The mere turning of a crank automatically causes a rotary drum to separate the coins so that they will drop into special compartments provided for them.

BRICK MACHINE.—DAVID A. KEIZER, Winnipeg, Manitoba, Can. In this improved brick-machine are embodied the elements of a series of molds with compressing dies linked together as an endless chain and provided with clay-mixing devices, packing devices for filling the molds, and pressing devices combined with a subjacent endless belt carrying detachable pallets or plates designed to receive the bricks from the molds and carry them away.

HAY OR COTTON PRESS.—ROBERT HAMILTON, P. O. Box 768, Pensacola, Fla. The press is a hand-operated machine for baling hay and seed cotton. The follower is provided with ratchet-bars; and the hand-levers are operatively connected therewith by means of pawls or dogs arranged to be tripped by a peculiar mechanism. To regulate the descent of the follower when the dogs are released a friction brake is employed. Automatic devices sustain the charge of compressed hay or cotton while the follower is descending and another charge is being inserted in the press-box. The lower portion of the press-box has a hinged door for receiving a charge of hay or cotton.

DRIER.—FRANK I. POST, HENRY BRIDGE, HARRY A. CUMPER, and HERMAN E. BROWN, Coldwater, Mich. The invention is an improvement in driers for slurry cement, clay, or other material designed to be calcined in a kiln. Mechanically considered, the device comprises a cylinder having vertically arranged extensions forming flues at opposite sides. In the cylinder a series of platforms are arranged, extending alternately from opposite sides at the extensions, and terminating alternately at opposite sides at the flues, forming openings for the passage of heat. Each of the platforms has an opening for the discharge of the material. A shaft is extended upwardly through the partitions and carries scrapers over the platforms. The device uses waste gases or heat from the kiln, and should therefore prove economical in operation.

SHARPENING-MACHINE FOR DRILL-BITS.—THEODORE H. PROSKE, Victor, Colo. This improved sharpening-machine quickly and accurately fashions and sharpens the bits of machine-drills. The construction comprises a frame which carries dies to hold the bit. A mechanism strikes blows upon the bit while held in the dies. The shank of the bit is held by a longitudinally-movable slide. A longitudinal screw journaled in stationary bearings engages the slide. The arrangement is simple and little liable to get out of order.

APPARATUS FOR THE MANUFACTURE OF GLASS BOTTLES, ETC.—WILLIAM DRAKE, 34 Eagle Street, Red Lion Street, London, England. Although the operation of forming the bottle comprises two stages, the neck portion being molded by positive mechanical pressure, and the body afterward blown in the mold, the successive movements of the parts are automatically coördinated in such a manner that the formation of the bottle is greatly accelerated. The outer blowing mold is made in two parts; and the blowing-tube is formed as a reciprocating plunger arranged to work through the neck of the mold and to act as a displacer, whereby to apply mechanical pressure to the glass for the purpose of molding the neck. The glass is contained in an inner temporary "parison" mold arranged to contain the glass during the first stage of the operation and to enable it to resist the pressure of the plunger, so that by the displacement of the latter the glass will, on the descent of the plunger, be forced up into the neck portion of the outer mold. Thus the perfect molding of the neck and mouth of the bottle before the blowing of the body will be insured.

BORING AND DRILLING MACHINE.—BENJAMIN E. HERVEY, Ritzville, Wash. The inventor has sought to provide a simple, cheap and practical form of boring and drilling machine designed for light work. Power is supplied by a treadle, and the boring-bit works in a horizontal plane. The boring-shaft is provided with a screw-threaded feed-shaft arranged behind the boring-shaft in alinement, and having a slower rotation to feed the boring shaft.

Miscellaneous Inventions.

BIB.—FANNIE MCCATHIE, Port Jervis, N. Y. The invention provides a bib of the usual material with an inner lining of waterproof fabric to prevent the passage of liquid through the bib. This lining is removable so that the bib can be readily washed.

STALL-FLOOR.—WILLIAM F. L. SPENGLER, Vailsburg, N. J. This improved stall-floor is of simple construction and is arranged to insure a perfect drainage as well as to permit the convenient removal of any one or all of the slats whenever necessary for cleaning the stall, for repairs, or for any other purpose.

ACETYLENE-GAS GENERATOR.—LUCIEN A. BOYER, Paris, France. The generator is designed to do away almost completely with overproduction and is distinguished by the fact that it has no movable part. Such a generator is particularly adapted to be applied to lamps for carriages. The apparatus consists essentially of a tube projecting from the top of a fixed bell, and extending down along the walls thereof and ending in a bend leading into an internal vessel slightly above the bottom of the fixed bell. The tube acts first to control the excess of gas in case of over-production, while maintaining a sufficient regularity of pressure to give steadiness to the flame. Furthermore, when over-generation occurs, the same tube serves to allow the water level to be lowered sufficiently as required by the escape of the excess of gas, while maintaining in the fixed bell the oil which the inventor spreads on the surface of the water.

SCREEN-PLATE HOLDER.—FRED W. BRAWN and FRANK L. FITZGERALD, Waterville, Me. The invention relates to improvements in the holders for screens in paper and pulp mills. The object is to provide a holder so constructed that the plates will be held solid, with perfectly tight joints, without the use of a great number of screws and bolts, as is ordinarily the case, and further so to arrange parts that the several plates can be removed or inserted in much less time than is required when screws or bolts are to be manipulated.

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Stencil Machines.—A. J. Bradley, 101 Beekman St. N.Y.

Inquiry No. 1666.—For manufacturers of the Gorin multigraph.

Gasoline Lamps and Systems. Turner Brass Works, Chicago.

Inquiry No. 1667.—For manufacturers of glass lenses 1 inch round and ⅛ inch thick.

Foot presses and dies. Amer. Hdw. Mfg. Co., Ottawa, Ill.

Inquiry No. 1668.—For an alcohol burner for use in automobiles.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No 1669.—For firms handling small T's or I's in the new alloy nickel steel.

Rigs that Run. Hydrocarbon system. Write St. Louis Motor Carriage Co., St. Louis, Mo.

Inquiry No. 1670.—For parties engaged in steel casting for models.

Our specialty is cutting and forming metal parts any shape. Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 1671.—For manufacturers of coffee roasters.

Ten days' trial given on Daus' Tip Top Duplicator. Felix Daus Duplicator Co., 5 Hanover St., N. Y. city.

Inquiry No. 1672.—For a successful oil burner for use under stationary boilers or locomotives.

Koster Electric Mf'g Co's, Self-fluxing solder saves labor, strong non-corrosive joints, without acid, Chicago, Ill.

Inquiry No. 1673.—For manufacturers of centrifugal machines as used in large sugar refineries.

Special and Automatic Machines built to drawings on contract. The Garvin Machine Co., 149 Varick, cor. Spring Streets., N. Y.

Inquiry No. 1674.—For manufacturres of machinery and materials for brush making.

New Book, Electric Gas Lighting. 50c. Send for full descriptive circulars, free. Spon & Chamberlain, 12 Cortlandt Street, New York, U. S. A.

Inquiry No. 1675.—For parties to manufacture a twine-cutting machine.

Manufacturers of patent articles, dies, stamping, tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 1676.—For manufacturers of steam and hot-water heating apparatus.

Designers and builders of automatic and special machines of all kinds. Inventions perfected. The W. A. Wilson Machine Company, Rochester, N. Y.

Inquiry No. 1677.—For a second-hand engine 125 to 150 h. p. slow-speed side valve or Corliss.

Wanted to manufacture machinery or anything for the southern trade. Correspondence solicited. Stevenson Machine and Repair Company, Bryan, Texas.

Inquiry No. 1678.—For manufacturers of gasoline forges.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 1679.—For address of makers or dealers in 24-inch mill rocks.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Inquiry No. 1680.—For address of emery and carborundum mills.

See exhibit in our building at the South Carolina Interstate and West Indian Exposition, Charleston, S. C., December 1, 1901-1902. Lane Manufacturing Company, Box 13, Montpelier, Vt.

Inquiry No. 1681.—For the present address of the makers of the "Cushman Chuck," formerly at Bridgeport, Conn.

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O. M. Clement on oath says that in six days he made eighty dollars selling The Turner Little Wonder Lamps. Sworn to and subscribed this 9th day of October, 1901. O. M. CLEMENT.

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We Want More Agents of this kind. Address The Turner Brass Works, 102 E. Kinzie St., Chicago.

Inquiry No. 1683.—For parties to make swedged brass or iron wirehandles, round or hexagonal, 3 inches long, to taper from 5 to 6 inches to 1-10 of an inch.

Inquiry No. 1684.—For manufacturers of stone crushers suitable for country roads.

Inquiry No. 1685.—For manufacturers of gas balloons.

Inquiry No 1686.—For the manufacturer of the automatic kneading trough invented in Boston.

Inquiry No. 1687.—For manufacturers of shooting gallery supplies.

Inquiry No. 1688.—For the address of the Eureka Doorholder Company.

Inquiry No. 1689.—For manufacturers of horseshoe machinery.

Inquiry No. 1690.—For manufacturers or patentees of sewing machine motors, spring motors preferred.

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Inquiry No. 1692.—For manufacturers of stills for burning charcoal and making wood charcoal.

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"Golden Crown Pure Rye Whisky," for whisky, H. Browarsky 8,803
"Joseph Heckmann's Shilop Furniture Polish and Cleaner," for furniture and wood polish and cleaner, J. Heckmann 8,810
"Medicated tooth pick," for toothpicks, R. W. Ivy 8,806
"Miniaturequill," for fat oil of turpentine, C. Lewis 8,811
"My Food," for cereal food, Pangburn & Steudell 8,805
"National Brand," for ladies' waists, Brod, Feld & Co. 8,812
"Pollack's Cream of Violets," for face lotion, Ascas Remedy Co. 8,807
"The Elk," for cigars, Schmidt & Co. 8,802

PRINTS.

"Dakota," for toilet preparations, M. Tharaldson 428
"Hot Springs Tablet," for a medicinal tablet, A. V. Stephenson 429
"O, Such a Headache," for a medicine, S. Pitzer 430
"The Ulbricht Shuffle Board Score Book," for Shuffle-board score books, M. Ulbricht 427

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

NEW BOOKS, ETC.

ELEKTRISCHE KRAFTUEBERTRAGUNG UND KRAFTVERTEILUNG. Nach Ausfuehrungen durch die Allgemeine Elektricitaets-Gesellschaft. Bearbeitet von C. Arldt. Third edition. Berlin: Julius Springer. 1901. Pp. 387. 16mo.

This little book, although issued by the Allgemeine Elektricitaets-Gesellschaft, of Berlin, is not strictly a trade publication. It is compiled by an engineer primarily for the purpose of showing the advantages of the electrical drive and the various applications of electrical power. Admirably printed and illustrated, replete with electrical information of a highly technical character, the work certainly does credit to Mr. Arldt and to the company which is its sponsor.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(8467) H. S. P. writes: In 1666 Sir Isaac Newton explained that white or colorless light is a mixture of an infinite number of differently colored rays, differing in refrangibility, the red being least and the violet most refrangible. Does this fact apply only to light or is white paint also a mixture of differently colored ones? A. In mixing lights the different tints are cast upon a surface and there blend. We see the combined effect of the different rays. This is the manner in which the seven colors of the spectrum as Newton named them, red, orange, yellow, green, blue, indigo, and violet, may be combined to form white light. Paints are mixed in color by a different process. When white light strikes a paint the paint absorbs some of the rays and reflects the rest. The rays reflected give the paint the color by which we recognize it. Thus a shade of yellow may be found which absorbs all of white light above the green and reflects the rest. A blue may be found which absorbs all below the green and reflects the rest of white light. If these two paints are mixed they each absorb as before, and because green is the only color which both can reflect, the mixture absorbs all of the white light, except green and reflects only green. This is the reason why we say that yellow and blue mixed are green. If instead we had cast the yellow and the blue light of these paints upon a white surface, the two lights would have combined and given us white, since these two colors contained all the elements of white light. You cannot mix colored paints to produce white. If paints of all the colors of the rainbow were mixed, the result would be a very dark mud, a color difficult to name.

(8468) J. C. P. asks: How may nickel be removed from copper articles by electrolysis? Will an ordinary plating solution do the work, provided the nickeled copper is made the anode? A. The plating can be transferred to the cathode by making the plated article the anode as you suggest. As soon as the nickel is off from any part, copper will then be carried over.

(8469) G. O. H. asks: Will you kindly inform some inquiring friends on what conditions depend the hazy appearance of the atmosphere known as "Indian summer" at this season of the year? I can find no reference to it in such works on meteorology as I have access to. A. The hazy atmosphere of late summer and early autumn is due chiefly to solid particles in the air. You will find it described in Russell's "Meteorology," price $4 by mail.

(8470) J. O. J. asks: What is the true theory of the wind going into the Wind Cave in South Dakota, at certain seasons, and going out again at other seasons? And does this prove that there are two openings? A. This phenomenon has been noticed in caves for at least three thousand years. The theory of the old Greeks was that caves were the lungs of the earth; hence their word "antron," a breathing-place. Æolus was fabled to sit in a cave holding all the winds in his fist. Travelers' tales relate that the blowing caves in Asia often carry caravans away. Thomas Jefferson vividly described the blowing cave of Panther Gap in the Alleghanies. Prof. Silliman, in 1852, sought to explain the blowing of Mammoth Cave on chemical principles. The theory now accepted is that the cave-air has a uniform temperature the year around. When the air outside is warmer an outward current is created, and the reverse when the outside air is colder. The atmospheric current does not "prove two openings;" but if they exist the fact might help to increase the activity of it by ventilation. This subject is fully discussed in Hovey's "Celebrated American Caverns."

(8471) W. M. R. asks as to the method of making what is called French silver gray on silver-plated hardware. Is the finish done by hand or on a wheel? If on a wheel, what kind of a wheel? A. Place the silver-plated ware in an aqueous solution of penta sulphide of potassium. Allow it to remain until the desired color is obtained. This depends upon the strength of the solution and the time it is immersed. Wash the articles, dry them, and polish with a buff wheel covered with chamois skin charged with fine rouge or upon a cotton wheel charged with the same material.

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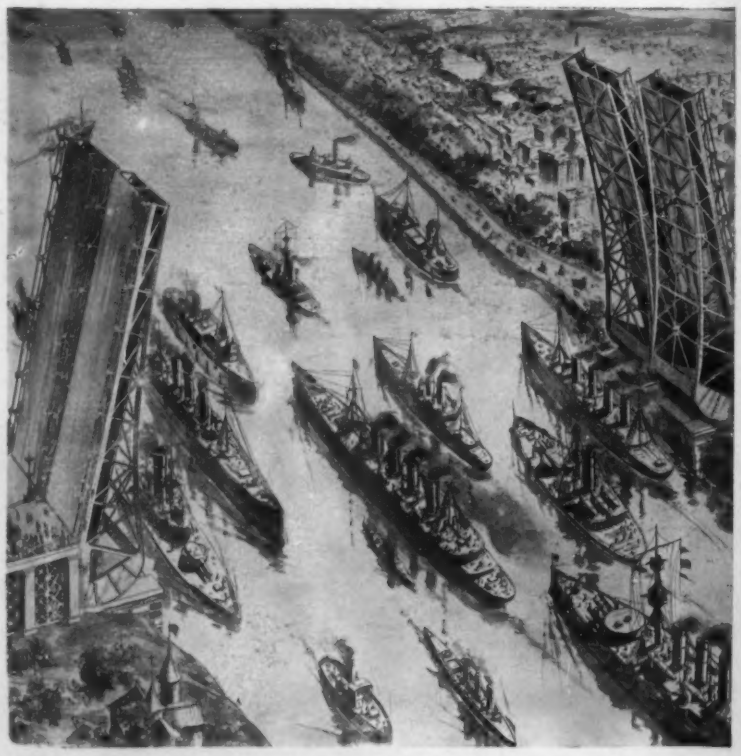

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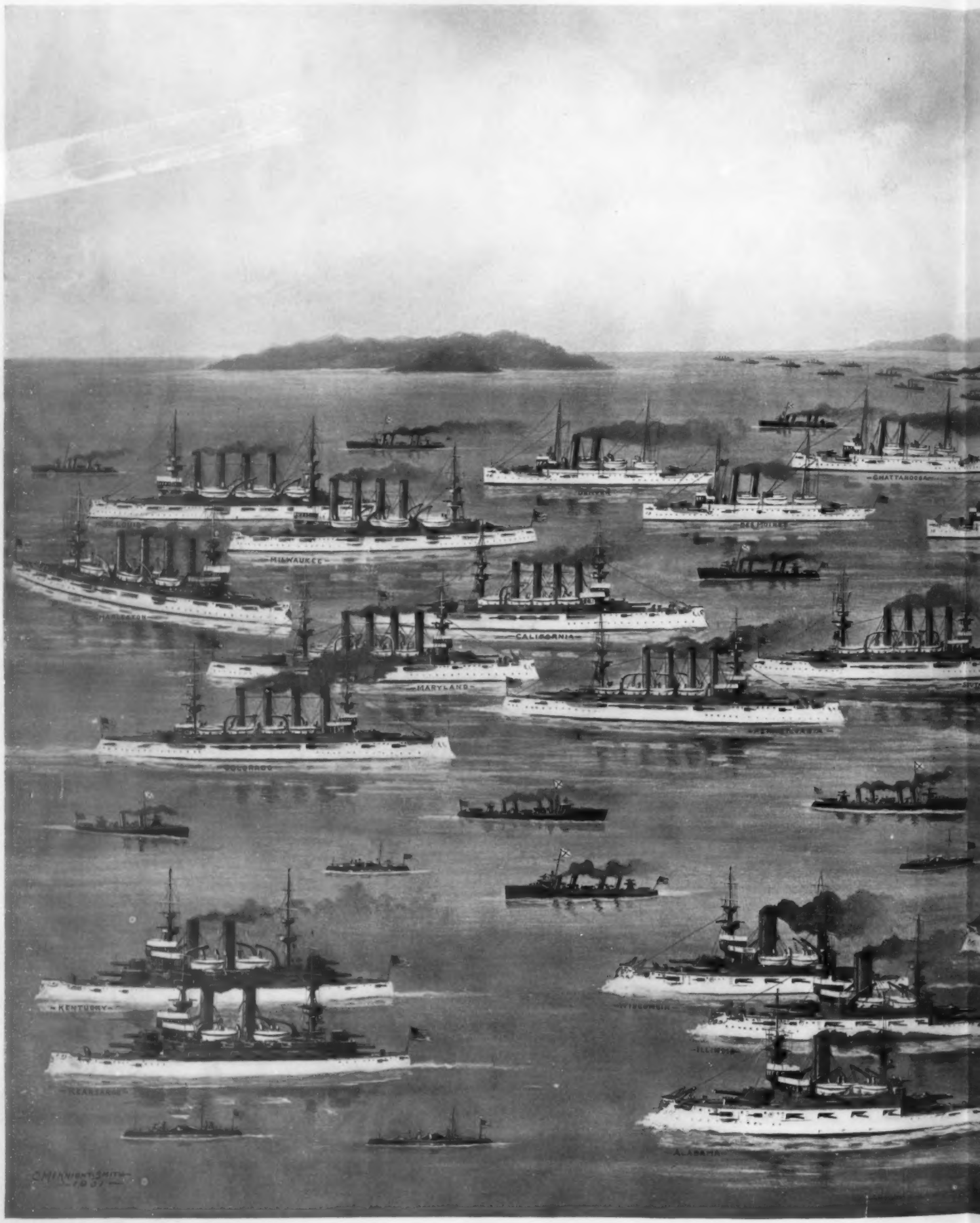

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